Interactive Book Reading to Accelerate Word Learning in Bilingual Children with Specific Language Impairment

By

Veronica Fierro
M.A., University of Kansas, 2001
M.S., University of Kansas, 1999
B.A., University of California, Los Angeles, 1995

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Chair: Holly L. Storkel

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Betty H. Bunce

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Nancy C. Brady

_____

Debora B. Daniels

_____

Lizette A. Peter

Date Defended: July 18, 2017

The dissertation committee for Veronica Fierro certifies that this is the approved version of the following dissertation:

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Chair: Holly L. Storkel

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Abstract

The current project sought to add to the limited body of research on treatment for native Spanish-speaking English language learners (ELLs) with language impairments. In particular, the current study explored the effectiveness of three bilingual treatment methods aimed at increasing the vocabulary knowledge of ELLs in English and Spanish. The goal was to find an appropriate treatment method that advances English and Spanish vocabulary while supporting an ELL's bilingual abilities. Typically, ELLs with language impairment receive intervention only in the majority language (English) due to the limited availability of bilingual speech-language pathologists (SLPs). As a result, although gains may be made in English, the attrition of the first language (L1) may occur due to the lack of support of the L1 during treatment. In the current study, different combinations of English and Spanish were utilized in order to get closer to determining the most appropriate amount or intensity of the L1 to use as a means to increase an ELL's English and Spanish vocabulary knowledge. Native Spanish-speaking preschool-aged ELLs with language impairments participated in a storybook-reading intervention study aimed at increasing vocabulary knowledge. The children were randomized into one of three bilingual treatment groups, which included two blocking conditions and a bridging condition. Treatment took place three to four days per week for a total of 26 sessions. In both blocking conditions, the language of intervention (Spanish/English) alternated on each day. In one blocking condition (Blocking: English First), English was used on the first day, followed by Spanish in day two, English on day three, and Spanish on day four. The other blocking condition (Blocking: Spanish First) was the opposite of the first one and, therefore, began with Spanish on day one. The Bridging condition consisted of treatment provided in English and Spanish during each session, with the percentage of each language use alternating on each day, such that on days one and three, approximately 75% Spanish and 25% English were used, and on days two and four,

approximately 75% English and 25% Spanish were used. Measurements of the children's vocabulary knowledge were taken in English and Spanish immediately after each session to determine how much vocabulary learning took place in both languages. The results of the current study suggest that the Blocking: Spanish First condition was ineffective at increasing vocabulary knowledge in English and Spanish, the Blocking: English First condition was effective at increasing vocabulary knowledge in English only, and the Bridging condition was the most effective at promoting vocabulary growth in both English and Spanish in ELL preschoolers with SLI.

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Table of Contents

List of Figures

List of Tables

Chapter 1: Review of the Literature

The literature reports a gap in vocabulary knowledge between English language learners (ELLs) and monolingual English speakers upon entering preschool and, in some cases, this limited vocabulary knowledge exists in both languages for ELLs (Mendez, Crais, Castro, & Kainz, 2015). Children with Specific Language Impairment (SLI) demonstrate smaller vocabulary knowledge and difficulty learning new words compared to typical peers (Gray, 2004). In the case of ELLs with SLI, this challenge is manifested in *both* their languages due to attrition of the first language (L1) and partial development of the L2, placing them at an even further disadvantage (Simon-Cereijido & Gutiérrez-Clellen, 2014). Given that vocabulary is a significant predictor of reading comprehension in general and specifically in ELLs, utilizing interventions that address vocabulary knowledge in ELLs-particularly ELLs with SLI-is significantly important (Restrepo, Morgan, & Thompson, 2013). Unfortunately, a paucity of research exists on intervention programs specifically aimed at increasing vocabulary knowledge in ELLs with SLI, and guidelines on instructional techniques and language of intervention are just beginning to emerge (Restrepo et al., 2013). Interactive storybook reading has been shown to be an effective treatment strategy for ELLs with and without language impairments in increasing vocabulary knowledge (Restrepo et al., 2013; Simon-Cereijido & Gutiérrez-Clellen, 2014; Tsybina & Eriks-Brophy, 2010; Collins, 2010; Silverman, 2007; Mendez et al., 2015; Lugo-Neris, Jackson, & Goldstein, 2010; Ulanoff & Pucci, 1999; Roberts, 2008; and Leacox & Jackson, 2014). Furthermore, it is a treatment strategy that can be implemented by various people (i.e., parents, teachers, paraprofessionals, etc.) and not just SLPs, particularly considering the limited number of bilingual professionals in the field. A research synthesis conducted by Durán, Hartzheim, Lund, Simonsmeier, and Kohlmeier (2016) on bilingual and home language

interventions found that parent involvement with book reading and systematic language stimulation techniques were effective in increasing the L1 and L2 of ELL children with language impairments.

This chapter provides a review of the literature focusing on theories on second language learning and bilingual development, vocabulary knowledge in ELL children, SLI in bilingual children, speech-language intervention for ELL children, and storybook reading intervention. The chapter ends with the research objective for the current study.

Theories on Second Language Learning

Cummins (1976, 1979, 1981, in MacSwan & Rolstad, 2005) presented three theories on second language acquisition in children, including the interdependence hypothesis, the threshold hypothesis, and the common underlying proficiency model. According to the linguistic interdependence hypothesis, initially proposed by Cummins in 1979, the development of skills in an L2 depends on the skill level of the L1, and evidence of linguistic interdependence transfer has been found for various types of language skills, including general language proficiency, vocabulary, narrative skills, and reading (Prevoo, Malda, Emmen,Yeniad, & Mesman, 2015). The facilitation theory, which stems from the linguistic interdependence hypothesis, posits a relationship between languages used in a bilingual setting, such that learning in an L1 facilitates learning outcomes in an L2 (MacSwan & Rolstad, 2005). However, according to MacSwan and Rolstad (2005), because both languages have access to the same storage of knowledge, which is available to learners regardless of how the knowledge was acquired in the first place, the usual meaning of linguistic interdependence transfer, which implies that a process moves knowledge from one language to another, is incorrect.

The threshold hypothesis states that two thresholds exist that affect cognitive growth, with attainment of the lower threshold being sufficient to keep children from falling behind academically, but attainment at a second, higher level of bilingual competence leading to accelerated cognitive growth (MacSwan & Rolstad, 2005). In addition, Cummins stated that children with low levels of proficiency in their L1 and their L2 may suffer negative cognitive effects until mastery of one language has been obtained. On the other hand, when a child develops high levels of proficiency in both languages, positive cognitive effects result (MacSwan & Rolstad, 2005). According to Lopez and Greenfield (2004), applied research has found a threshold effect with regard to bilingualism in which performance in the L1 affects educational attainment in the L2. As a result, children must have a grasp on language skills in their L1, specifically phonologically, morphologically, and syntactically prior to beginning the process of learning to read (Lopez & Greenfield, 2004). Finally, Cummins' common underlying proficiency model proposes that the developmental domains of the L1 and the L2 have a shared underlying proficiency which allows a child to draw upon the skills and knowledge they have in one language when working in the other language. In addition, any expansion of the common underlying proficiency that takes place in one language will benefit the other language (MacSwan & Rolstad, 2005). Whereas the emphasis of these theories is on the acquisition of dual language, other theories focus on how dual languages are represented in the linguistic system of bilingual children.

The Unitary System Model and the Dual Systems Model have been proposed to explain how the languages of bilingual children are represented, either as one linguistic system or two (Goldstein, 2006). According to Goldstein (2006), the Unitary System Model proposes that linguistic elements exist in a single storage system that differentiates into two separate systems

later in development. However, this model has been criticized based on the nature of the evidence used to support the model, which primarily includes language mixing (i.e., the use of language features of one language in the other language). Evidence has contradicted the Unitary System Model through the demonstration that language mixing (either lexical or sentential) across the two languages is low. The Dual Systems Model, on the other hand, has received more acceptance. This model proposes that there is a separate system for each language, yet the two systems interact with each other along three specific patterns: *acceleration, decelaration,* and *transfer* (Paradis and Genesee, 1996; as cited in Goldstein, 2006). *Acceleration* is the acquisition of a structure earlier than expected due to "assistance" from the other language, such as the acquisition of /l/ in Spanish-English bilinguals compared to English-only speakers. *Decelaration* is a delay in acquisition of a particular structure in both languages, such as the later acquisition of the plural morpheme in Spanish-English bilinguals compared to monolingual English-speaking children. *Transfer* takes place when the linguistic feature of one language is temporarily incorporated into the other language, such as when bilingual children demonstrate the flexible word order in Romance languages with less flexible word order in a language such as English (Goldstein, 2006).

In summary, these current theories agree that there is a relationship between L1 and L2 acquisition, although the exact nature of that relationship is open to debate. However, the strong agreement that the L1 and L2 interact suggests that a bilingual approach to the treatment of ELLs with SLI may be better than a single language approach, and emerging clinical research offers further support for this hypothesis.

Vocabulary Knowledge in ELLs

The early English vocabulary knowledge of typical ELLs is significantly smaller than that of monolingual English speakers (Vadasy, Nelson, & Sanders, 2011). Research has demonstrated that ELLs lag behind their English-speaking peers in depth and breadth of vocabulary knowledge, even for frequently occurring words (August, Carlo, Dressler, & Snow, 2005). The division of a typical ELL's word knowledge between his/her two languages leads to reduced scores in English vocabulary measures as significant as two standard deviations below the mean (Fitton, Bustamante, Wofford, Brown, Gabas, Hoge, & Wood, 2016). Children who grow up in low-income households demonstrate lower language abilities, particularly in the area of vocabulary development, and Latino children in the United States are the largest group of children growing up in poverty (Durán et al., 2016).

The limited vocabulary knowledge of ELLs plays a role in their academic success. ELLs who experience a slower development in English vocabulary may demonstrate a reduced understanding of English-only academic material, leading to difficulties with learning, diminished literacy, and lower academic achievement (Fitton et al., 2016; August et al., 2005). The achievement gap between monolingual English children and ELL children in the areas of reading and math readiness skills is noticeable in the preschool years, with Spanish-speaking preschoolers beginning preschool with low levels of phonological awareness, letter identification, and emergent literacy skills in both English and Spanish (Lindholm-Leary, 2014). As a result, large and persistent gaps between the reading performance of language-minority and English-only children exist, with national reading tests demonstrating English-only speakers having a 22-29 point scale score advantage over ELLs (August et al., 2005). Schools have access to many effective early core and supplemental programs and methods to teach ELLs

phonological awareness and word reading skills, yet vocabulary instruction is often not a part of early reading instruction (Vadasy et al., 2011).

Greater shortfalls in language and literacy may be expected from ELLs from low-SES families due to lower levels of English proficiency, below average performance in reading achievement, and fewer books in the home, resulting in less frequent shared reading opportunities (Jackson, Schatschneider, & Leacox, 2014). High correlations, as high as .73, have been found between academic achievement and SES, and by age three, the correlation between frequency of adult verbal input and children's expressive language skills is .84 (Towson & Gallagher, 2014). In summary, the future schooling success of typical ELLs can be negatively impacted by the risk factors of low SES, low parent education, low vocabulary knowledge, and a lack of proficiency of the majority language (Lindholm-Leary, 2014). When SLI is added to the mix, the problem becomes even more pronounced.

Specific Language Impairment in Bilingual Children

Specific Language Impairment (SLI) is a developmental disorder in which language delays are apparent in the absence of associated intellectual, hearing, neurological, or psychological disorders (Ebert, Rentmeester-Disher, & Kohnert, 2012). Insufficient data are available to report on the exact prevalence of language impairments in ELLs (Durán et al., 2016). However, it is assumed that, similar to the rate found in monolingual English children, five to 12 percent of preschool ELLs have SLI (Kohnert, 2008; Durán et al., 2016). By definition, ELLs with SLI are slower to acquire their L1, develop a faster attrition of their L1, and only obtain a partial development of their L2, particularly when the instruction is only provided in the L2 (Ebert, Kohnert, Pham, Disher, & Payesteh, 2014; Simon-Cereijido & Gutierrez-Clellen, 2014; Restrepo et al., 2013). The precise cause of SLI is unknown, affecting both languages in

bilingual children, yet the determination of what constitutes impairment in each language has to be done in reference to peers with similar experiences (Ebert et al., 2014). Risk factors for language impairment include growing up in low-income households and growing up as an ethnolinguistic minority in a monolingual majority context where not enough support in the L1 is provided to maintain a typical trajectory of development (Durán et al., 2016).

The growing literature on bilingual children with SLI characterizes them as having a history of delayed language acquisition, performing significantly below their unaffected bilingual peers in various language areas, including lexical, semantics, morphosyntax, code switching in discourse production, and performing poorly on language processing tasks (i.e., nonword repetition, rapid automatic naming, and novel morpheme learning) and standardized tests of language (Ebert et al., 2014).

Differences have also been found in the language development of bilingual children with SLI depending on their environment and whether they learned two languages simultaneously or sequentially. Bilingual children with SLI in an additive bilingual situation (i.e., both languages are supported) produce similar errors to their monolingual counterparts, such as errors on the verb phrase, possessives, and passive sentences in English, and errors in articles, the preterite, clitic pronouns, and the subjunctive mood in Spanish (Goldstein, 2006). Bilingual children with SLI who are in a subtractive bilingual environment, such that one language is not supported, are at risk of degradation of language skills, particularly morphosyntactic and vocabulary skills (Goldstein, 2006). After conducting a completed narrative review of the literature, Kay-Raining Bird et al. (2016) discovered a difference in bilingual language development between simultaneous bilinguals with SLI and sequential bilinguals with SLI. Whereas simultaneous bilinguals with SLI showed comparable language abilities to monolinguals with SLI, in each of

their languages, sequential bilinguals with SLI demonstrated poorer language skills in the majority L2. In addition, even after seven years of exposure to the L2, the language abilities of sequential bilinguals with SLI did not catch up to their L1 skills. Considering that L1 attrition occurs rapidly in bilingual children with SLI, a loss of their L1 and incomplete acquisition of the L2 places these ELLs with SLI at an increased risk for academic failure.

Speech-Language Intervention for ELLs

Most ELLs with SLI receive intervention only in English. According to Ebert et al. (2014), at least three reasons exist for the prevalent use of "English-only" treatment, including the critical shortage of bilingual SLPs, the belief that English should be the sole focus of instruction given that English is the primary language of academic and vocational success, and because school-age children may demonstrate stronger abilities in English than their L1, building on the current strength may have some validity in addition to immediate educational relevance. Nevertheless, although it may be assumed that the more extensive the exposure to the target language the better the acquisition of the target language will be, this approach does not consider the roles that both languages play in the vocabulary development of ELLs (Mendez et al., 2015). Just like monolingual children need one language to be successful in their communicative environments, bilingual children need two languages to be successful in theirs, which means explicit support for both languages is needed (Kohnert, 2008; Goldstein, 2006). According to Durán et al. (2016), development of a home language and development of the majority language are not mutually exclusive and can be supported simultaneously in intervention.

Providing intervention only in English has serious implications for the maintenance of the L1 of ELLs, particularly because providing treatment in the L2 has minimal effects in the L1 for children with SLI (Ebert at al., 2014; Simon-Cereijido & Gutiérrez-Clellen, 2014; Restrepo et al.,

2013). Research has demonstrated that gains in either language require direct targeting of that language (Thordardottir, Cloutier, Ménard, Pelland-Blais, & Rvachew, 2015). In the case of vocabulary, children acquire it in the context in which they hear it (Restrepo et al., 2013). As a result, ELL children may know certain vocabulary terms only in Spanish and some only in English. Particularly in the case of ELLs with SLI, gains in the L1 occur only when purposeful and systematic instruction in the L1 is provided (Mendez et al., 2015; Restrepo et al., 2013). Incorporating the L1 in intervention is not only useful in advancing an ELL's academic abilities, but their social communicative abilities as well, particularly when their families only speak the L1 (Durán et al., 2016).

ELL children with language impairments can be bilingual without consequences to their communication and bilingual interventions support better language outcomes than interventions provided only in English (Durán et al., 2016; Restrepo et al., 2013). Various agencies (i.e., the National Institute of Early Education Research, the National Task Force on Early Education for Hispanics, the Latino legislative hearing on prekindergarten and the early grades, the American Speech-Language-Hearing Association, the Division for Early Childhood of the Council for Exceptional Children, and the National Association for the Education of Young Children) all recommend the inclusion of a child's L1 in the assessment and intervention of ELLs (Durán et al., 2016). Sufficient evidence exists to support the use of a bilingual approach in the language, literacy, and academic outcomes of ELLs. Language intervention studies have shown clear, positive effects specific to the language(s) of intervention, which is why only bilingual intervention results in positive changes in both languages (Kay-Raining Bird, Trudeau, & Sutton, 2016). A review by Durán et al. (2016) on the effects of bilingual or home language interventions on the language outcomes of ELLs generally indicated that bilingual or L1

interventions promoted superior home language growth and did not negatively affect growth in the L2.

Unfortunately, in spite of the increasing body of evidence in support of bilingual interventions, SLPs—particularly monolingual SLPs—continue to remain unguided with regard to examples of the best, research-based, empirically-tested treatment methods available (Durán et al., 2016). Theoretically, the obvious advantage of bilingual intervention is that it targets both languages, yet, beyond theoretical support for bilingual intervention, the availability of published evidence on language intervention for bilingual children is limited (Thordardottir et al, 2015). SLPs have seen an increase of ELLs on their caseloads and, yet, only 10% of SLPs working in preschool settings rate themselves as very qualified to work with children from dual language learning backgrounds (Durán et al., 2016). Durán et al. (2016) suggest that, considering there is a limited number of bilingual SLPs, monolingual SLPs can involve parents, interpreters, and bilingual early childhood staff in order to implement effective bilingual and home language interventions. Unfortunately, the effectiveness of interpreters in clinical intervention with children has not been documented and the efficacy of including parents from multicultural backgrounds is also largely untested (Thordardottir et al., 2015). Much work needs to be done to promote bilingual intervention and to make its application less complicated in order to better encourage SLPs to implement it in their work with ELLs with language impairments.

Storybook Reading Intervention with Typical ELLs

Repeated storybook readings are a pedagogical tool that have shown to be effective in increasing vocabulary growth in ELL children (Cruz de Quirós, Lara-Alecio, & Tong, 2012). Studies on vocabulary learning with ELLs with and without SLI that utilized a storybook reading intervention method have demonstrated the effectiveness of using this approach to increase

vocabulary growth. The studies with typically-developing ELLs that only used the L2 (Collins, 2010; Silverman, 2007) reported that providing definitions in English of vocabulary words, even when those words were very sophisticated or not central to the plot, was helpful to the word learning of typical ELLs (Collins, 2010). However, the studies that utilized a bilingual approach (Ulanoff & Pucci, 1999; Lugo-Neris et al., 2010; Leacox & Jackson, 2014; Mendez et al., 2015; Roberts, 2008) demonstrated that incorporating the L1 into treatment was more effective than only using the L2 in the teaching of vocabulary in English to ELLs with typical language development. Furthermore, they all demonstrated that including the L1 in the teaching of ELLs does not compromise L2 learning (Roberts, 2008).

Storybook Reading Intervention with ELLs with SLI

The studies on storybook reading intervention conducted on ELL preschool children with SLI (Restrepo et al., 2013; Tsybina & Eriks-Brophy, 2010; Simon-Cereijido & Gutiérrez-Clellen, 2014) have also provided evidence of the advantages of bilingual intervention versus English-only intervention in the language development of ELLs with SLI. Of these studies, only two (Restrepo et al., 2013 and Tsybina & Eriks-Brophy, 2010) specifically focused on the vocabulary learning of the words taught during the intervention, whereas the study by Simon-Cereijido and Gutiérrez-Clellen (2014) measured the change in the children's number of different words (NDW), mean length of utterance in words (MLUw), and total number of verbs (TNV) in English and Spanish prior to and after treatment to assess the effectiveness of the program. The results of the study by Simon-Cereijido and Gutierréz-Clellen (2014), demonstrated that the children with SLI demonstrated higher scores on all of the measures taken (NDW, MLUw, and TNV) following the bilingual program, compared to the children with SLI who participated in the English-only program.

The studies by Restrepo et al. (2013) and Tsybina and Eriks-Brophy (2010) are the only two vocabulary-learning, storybook-reading intervention programs that have been tested on ELLs with SLI: one used a collaborative researcher-parent intervention and the other used a researcher-only intervention. Table 1 below provides a summary of how these studies compare with each other. In the study by Tsybina and Eriks-Brophy (2010), dialogic book-reading intervention sessions were conducted in English by the primary investigator and in Spanish by the participants' mothers. A total of 30, 15-minute sessions were conducted over the course of six weeks in each language. Each child was individually assigned a set of target words and books in each language. The books were not the same for the Spanish and English sessions. Measurements were taken of the learning of the target vocabulary, as well as the gains that were made in overall vocabulary based on the subtraction of the number of words reported by parents at intake from that at posttest on the MacArthur-Bates Communicative Developmental Inventory (MBCDI) and the MacArthur: Inventario Del Desarrollo de Habilidades Comunicativas (MIDHC). During the first week of treatment, three words were targeted in each language, with a particular pair of books. In the second week, three more words were targeted with another pair of books and, in the third week, four words were targeted with a third pair of books. The cycle was then repeated with the same words and books in the second half of the intervention phase. The results of this study demonstrated that, compared to the delayed treatment control group, the children who received the intervention learned significantly more of the target words in English and Spanish. Furthermore, at follow-up six weeks later, the participants maintained the learning of the target vocabulary. In terms of overall vocabulary gains, no significant differences were noted between the intervention and control group. Tsybina and Eriks-Brophy (2010) reported that the acquisition of English target words was higher compared to the Spanish target words.

Furthermore, because the sessions were conducted in the children's homes and observations of the Spanish sessions were only done on a weekly basis, it was impossible to determine whether the sessions conducted by the mothers were actually all in Spanish, or whether code-switching during the sessions may have taken place.

Table 1. Comparison of Storybook Reading Intervention Studies with ELLs with SLI

	Tsybina & Eriks-Brophy (2010)	Restrepo et al. (2013)
Number of Participants receiving bilingual treatment	6	Approximately 50
Control groups	6 receiving no treatment	Approximately 50 in each of the following groups: English-only vocabulary, bilingual math, English-only math. 54 typically-developing children receiving no treatment;
Age of participants	22-42 months old	48-64 months old
Length of Treatment	6 weeks	12 weeks
Study site	home	school
Mode of treatment	Individual	Group (2-5 children)
Administrator of Treatment	researcher and parents	graduate students, previous kindergarten or preschool teachers
Immediate Results	Treatment group learned significantly more words in English and Spanish compared to control group. More words learned in English compared to Spanish.	Bilingual vocabulary group outperformed other groups on measures of Spanish receptive and expressive vocabulary. Bilingual vocabulary group outperformed all groups, except for English-only vocabulary group, in English receptive and expressive vocabulary. No differences in English vocabulary gains between bilingual vocabulary group and English-only vocabulary group.
Follow-up Results	6-week follow-up demonstrated maintenance of vocabulary learned	4-month and 8-month follow-up demonstrated maintenance of vocabulary learned

The study by Restrepo et al. (2013) utilized a 12-week, four-days-per-week program and the intervention was applied in small groups of two to five children. The children were randomized into one of four interventions groups: bilingual (Spanish/English) vocabulary, English-only vocabulary, bilingual math, or English-only math. The bilingual programs differed

from the English-only programs in that the language of instruction varied per day, with Spanish used on the first day, English on the second day, and, for the remaining two lessons, the two languages were alternated in a different order each week. The vocabulary groups included nine weeks of vocabulary units and three weeks of review sessions. During the first three weeks, a new book was introduced per week and the children were taught five target vocabulary words each week. Following the three weeks, the next week was a review week in which the vocabulary from the previous weeks was reviewed. This cycle was repeated during the 12 weeks, totaling nine weeks of intervention units and 45 total target vocabulary words. The same books, materials, vocabulary targets, and activities were used in the bilingual vocabulary program as in the English vocabulary intervention with the exception that, on the days Spanish was used, the Spanish version of the books were read and the vocabulary targets (translation equivalents of the English vocabulary) were in Spanish.

The results of the study by Restrepo et al. (2013) demonstrated that, immediately following the intervention, the bilingual vocabulary group outperformed the other groups (English vocabulary, bilingual math, English math, and typically-developing peers receiving no intervention) on measures of Spanish receptive vocabulary and Spanish expressive vocabulary. In terms of English receptive and expressive vocabulary, the bilingual vocabulary group outperformed the bilingual math group, English math group, and typically-developing peers, with no differences found between the bilingual vocabulary intervention group and the English-only vocabulary intervention group. At follow-up four and eight months later, the bilingual vocabulary group maintained their gains. By the eight-month follow-up, the other groups had caught up to the bilingual vocabulary group on English and Spanish receptive vocabulary. However, with regard to expressive vocabulary, the bilingual vocabulary group's scores in

Spanish were higher than the other groups and their scores in English were higher than the other groups with the exception of the English vocabulary and the typically-developing groups. No significant differences existed between the English expressive vocabulary of the bilingual vocabulary group, the English vocabulary group, and the typically-developing group at follow-up eight months later. The study by Restrepo et al. (2013) demonstrated that, to improve English vocabulary, it is not necessary to provide intervention in that language alone. The bilingual vocabulary intervention group not only made the same gains in English vocabulary as the English-only group with instructional time divided evenly between English and Spanish, but they made gains in Spanish vocabulary as well.

Both of these vocabulary-learning studies on ELLs with SLI proved successful in increasing vocabulary knowledge in English and Spanish. Although numerous differences existed between the studies, one commonality they shared was that they employed a blocking approach, meaning that only one language was used per day during treatment. Other studies have employed a bridging approach, in which both languages were used during a treatment session. A review of how the blocking approach and the bridging approach have been utilized in storybook intervention studies with ELLs with and without SLI will be discussed next.

Blocking Approach versus Bridging Approach. Research has demonstrated that both the blocking approach and the bridging approach have proven to be effective in increasing the vocabulary knowledge of ELLs. However, the bridging approach has only been tested on ELLs with typical language development (Ulanoff & Pucci, 1999; Lugo-Neris et al., 2010; Leacox & Jackson, 2014; Mendez et al., 2015). In addition, the bridging approach was implemented differently in each study. In the study by Ulanoff and Pucci (1999), bridging was applied in two different conditions: 1) the storybook was read in both English and Spanish using a concurrent

translation method (translating the story from one language to the other), and 2) a preview of vocabulary and important points of the story were first provided in Spanish, followed by the storybook read in English, and then a review of the story in Spanish. Ulanoff and Pucci (1999) reported that the preview-review condition proved most effective in the teaching of vocabulary. Lugo-Neris et al. (2010) implemented a bridging approach by providing expansions in Spanish to the English-named vocabulary within the context of the book readings. In the study by Leacox and Jackson (2014), bridging was provided via e-book software that included pre-recorded audio files in Spanish. The participants listened to text from the story and then clicked on the image of the target word. Upon clicking on the image of the target word, the participants heard a context sentence in Spanish, a definition in Spanish, and a Spanish translation of the English vocabulary. In the study by Mendez et al. (2015), the participants were read a book each week for a total of five weeks. For the participants in the bilingual condition, the book-reading and treatment on Day 1 were provided only in Spanish. On Day 2, the book was read in English and the treatment was provided in both English and Spanish during the session, and on Day 3, the book-reading and treatment were all given in English.

The vocabulary learning studies that used a blocking approach (i.e., one language only per session) included one with typical ELLs (Roberts, 2008) and two with ELLs with SLI (Restrepo et al., 2013; Tsybina & Eriks-Brophy, 2010). The studies by Roberts (2008) and Tsybina and Eriks-Brophy (2010) both utilized parent involvement for the storybook readings in the L1. In both studies, the participants' parents were assigned books in the native language to read to their children at home and the storybook reading sessions in English were conducted by a researcher. The study by Tsybina and Eriks-Brophy (2010) did not specify the order of how the languages were blocked (i.e., Spanish intervention followed by English or vice versa). In the

study by Roberts (2008), the parents took the books home in the L1 (Hmong or Spanish) on a Friday (and kept them until the following Friday) and the following week, two intervention sessions in English were implemented. It would, therefore, be assumed that in the study by Roberts (2008) the first language blocked was the L1 (if the parents read the books to their children over the weekend) and, depending on when the parents read to their children, the language of intervention varied throughout the week. In the study by Restrepo et al. (2013), which was a researcher-led treatment, the blocked sessions always began with Spanish on Day 1, followed by English on Day 2, and for Day 3 and Day 4, the two languages (Spanish and English) were alternated in a different order each week.

In the current study, based on the existence of research evidence that has demonstrated the effectiveness of blocking and bridging approaches, but, yet, no comparison of these approaches has been made, three different approaches for combining the two languages were used, including two blocking conditions (Blocking: English First; Blocking: Spanish First) and a bridging condition (using the L1 and L2 during the same day in the same treatment session).

Controlling for the Number of Exposures. Very few studies on interactive book reading with children with and without SLI have controlled for the number of exposures. In their study with typically-developing children from low-income homes, the participants in the study by Justice, Meier, and Walpole (2005) demonstrated progress when 12 exposures per word were provided (i.e., three exposures to each word per book and the book was read four times). A recent study by Storkel, Voelmle, Fierro, Flake, Fleming, and Romine (2017) with kindergarteners with SLI demonstrated that the children made the most progress when 36 exposures were provided compared to 12, 24, and 48 exposures. In terms of interactive book reading intervention studies with ELLs, only some of the studies with typical ELLs have

controlled for the number of exposures (Collins, 2010; Lugo-Neris et al., 2010; Leacox & Jackson, 2014; Mendez et al., 2015), with the number of exposures ranging from three to five exposures. So far, none of the studies performed on ELLs with SLI have controlled for the number of exposures. As a result, limited guidance is provided to SLPs on how many exposures they should be providing to ELLs with SLI. Furthermore, due to the lack of control for the number of exposures in interactive book reading studies with ELLs, isolating the variables that led to progress or lack of it are difficult to determine. For example, the higher gains in English compared to Spanish reported by Tsybina and Eriks-Brophy (2010) and Simon-Cereijido & Gutiérrez-Clellen (2014) make it difficult to ascertain whether the higher gains in English may have been attributed to more exposures provided in English vocabulary or to other factors. This study will follow the guidance of a prior study (Storkel et al., 2017) with monolingual children with SLI that showed that 36 exposures was adequate.

Research Objective

The long-term goal of this research is to develop a bilingual (English/Spanish) interactive storybook reading intervention for ELLs with SLI aimed at increasing vocabulary knowledge in both languages. The objective of the current study was to determine the appropriate combination of the L1 and the L2 that would maximize vocabulary learning in both languages. Learning of the taught vocabulary was determined through the participants' performance on a naming task (i.e., providing the correct label after being shown a picture) and/or a comprehension task (i.e., correctly identifying the picture associated with the word named from a picture plate containing five pictures). The specific aims of this research study include:

Aim 1. Determine the effectiveness of each treatment condition based on the learning of the experimental versus control words for each participant in that condition. This is the first

study to explore three different bilingual conditions (i.e., Blocking: Spanish First, Blocking: English First, and Bridging) in the teaching of vocabulary via a storybook reading intervention method to ELLs with SLI. Of these three different bilingual conditions, only the Blocking: Spanish First condition has been tested on preschool ELLs with SLI.

Based on the available research on storybook reading intervention with preschool ELLs with SLI and the current theories on dual language acquisition, it is expected that, of the three conditions, the participants will demonstrate the most learning of the experimental words in the Blocking: Spanish First condition, with minimal learning occurring in the Blocking: English First condition. Considering that the Bridging condition (which consists of treatment provided in English and Spanish during each session, with the percentage of each language use alternating on each day) has not been implemented on preschool ELLs with SLI, but, yet, it has been shown to be effective with typical preschool ELLs, it is expected that some learning of the experimental words will take place by the participants in the Bridging condition. However, the extent of that learning is difficult to predict at this time.

Aim 2. Compare the treatment conditions that were effective via descriptive analysis based on the weighted average (i.e., the combination of the participants' individual results into one analysis for each condition) of treatment versus no treatment for the participants in each condition using the Tau-*U* metric effect size calculator (Vannest, Parker, & Gonen, 2011). The information obtained from this analysis will set the foundation for a larger group design aimed at comparing different bilingual conditions.

Based on the prediction that the participants in the Blocking: Spanish First condition will demonstrate the most learning of the experimental words, with minimal learning expected in the Blocking: English First condition, it is expected that the analysis will demonstrate significant

learning of the treated versus untreated words for the Blocking: Spanish First condition, but not for the Blocking: English First condition. Based on the unavailability of research with bridging methods and preschool ELLs with SLI, a prediction of the outcome of the analysis for the Bridging condition is difficult to make at this time.

The information provided from this research study will allow us to develop, or get closer to developing, a treatment plan for bilingual children with SLI in the acquisition of English and Spanish vocabulary knowledge. Furthermore, it will provide us with information with regard to what level of bilingual support is most beneficial for the teaching of vocabulary in English and Spanish.

Chapter 2: Method

Participants

Nine bilingual, four- to five-year old children (*M* = 4;6, *SD* = 0;5, range 4;0 – 5;4) with SLI participated in the current study. They were all of Mexican descent and included five boys and four girls. All of the children attended English-only preschool or head start programs within the Topeka Public Schools, and they all received speech-language services within the school setting. With permission from the Topeka Public Schools' research committee, the primary investigator consulted with speech-language pathologists and early childhood education teachers for referrals. The primary investigator, who is a fluent speaker in English and Spanish, contacted the parents of the children referred to explain the study and to set up a time to visit with the parents in order to have them sign the consent form, fill out questionnaires, and answer any questions. In addition, the primary investigator conducted all of the testing and treatment sessions, which were audio- and video-recorded. The consent forms and all questionnaires were available in English and Spanish. All of the children's parents responded to questions on the Bilingual Input-Output Survey (BIOS)-Home Language Exposure/Use History and the BIOS Home Language Profile regarding their child's language history over time, their child's level of exposure to the languages, and current use in the home and other settings. All of the children met the minimal subject selection criteria for the current study, which included (based on parent report): the majority language spoken in the home was Spanish, the first language spoken by the child was Spanish, the child was not a native English speaker, and the child was exposed to English on a regular basis, at least 20% of the time. As summarized in Table 2, based on the children's percent average Spanish Input-Output (SIO) and English Input-Output (EIO) scores on the BIOS, most of the children were currently getting a fairly balanced English-Spanish

exposure. The average EIO score (i.e., the average percentage of English input and output) for all the participants was 48% and the average SIO score (i.e., the average percentage of Spanish input and output) for all the participants was 52%. In addition, none of the children demonstrated any hearing impairments, cognitive delays, emotional disturbances, motor difficulties, or neurological deficits, based on parent report. As noted in Table 2, five out of the nine participants' parents did not speak English.

All of the participants passed a pure tone hearing screening at 25 dB HL at 1000, 2000, 3000, and 4000 Hz. In Table 2 below, a summary is provided of the participants' scores on the questionnaires and assessments administered. All of the children demonstrated nonverbal cognitive development within the normal range on the Reynolds Intellectual Assessment Scale (RIAS, Reynolds & Kamphaus, 2013), scoring at or above the 16th percentile, with the average score for all the participants falling at the 50th percentile. In order to ensure understanding of the tasks on the RIAS, the instructions were provided to the participants in English and Spanish. The participants' language was assessed in English and Spanish using three English subtests (English phonology, English morphosyntax, and English semantics) and three Spanish subtests (Spanish phonology, Spanish morphosyntax, and Spanish semantics) of the Bilingual English Spanish Assessment (BESA, Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014). In order to qualify as having SLI, the children had to receive a Language Index percentile score of 10 or below on the BESA, which was determined by combining the highest morphosyntax and semantics scores obtained between the languages. For example, if the child scored a higher morphosyntax score in Spanish compared to English and a higher semantics score in English compared to Spanish, the Spanish morphosyntax and the English semantics scores were used to determine the Language Index percentile score. The mean Language Index percentile score for

all of the participants was a percentile score of four. A total of 13 children were assessed for the study, three of which did not qualify based on Language Index percentile scores above the 10th percentile on the BESA. In addition, one participant was dismissed from the study due to multiple absences.

Table 2. Summary of Participants' Scores on Each Measure Divided by Condition.

Treatment Condition	Participant	BIOS English IO	BIOS Spanish IO	RIAS Nonverbal Intelligence Index PR (SS)	BESA Language Index PR (SS)
Blocking: Spanish First	BTP01*	36%	64%	19 (87)	3 (72)
	BTP07*	48%	52%	34 (94)	4 (73)
	BTP08*	34%	66%	63 (105)	3 (71)
Blocking: English First	BTP03	57%	44%	84 (115)	9 (80)
	BTP12	68%	32%	45 (98)	3 (71)
	BTP13	58%	42%	79 (112)	5 (76)
Bridging	BTP04*	45%	55%	42 (97)	7 (78)
	BTP05*	34%	66%	16 (85)	3 (71)
	BTP10	52%	49%	70 (108)	7 (78)
Mean Scores (across all participants)		48%	52%	50 (100)	4 (74)

Note. The percentage of language use is displayed for the BIOS scores. For nonverbal intelligence and language testing, percentile ranks (PR) are displayed with standard scores (SS) in parentheses. BIOS = Bilingual Input-Output Survey; IO = Input-Output; RIAS = Reynolds Intellectual Assessment Scale; BESA = Bilingual English-Spanish Assessment.

*Indicates parents only spoke Spanish.

In Table 3, each participant's scores on the English and Spanish subtests of the BESA are displayed. The phonology subtest does not contribute to the language index. However, eight of the nine children showed phonology scores at or below the ninth percentile (standard score of 80) for English. Spanish phonology scores were at or below the ninth percentile (standard score of 80) for seven of the nine children. All children demonstrated performance below the fourth percentile (standard score of 73) for both English and Spanish in morphosyntax. In semantics, eight of the nine participants performed below normal limits, at the 13th percentile (standard score of 83) or below, in English. In the Spanish subtest of semantics, six of the nine children scored below the 16th percentile (standard score of 85). Overall, scores were relatively similar

across English and Spanish, suggesting that the two languages were equally weak for most children.

Table 3. Summary of Participants' Scores on the Subtests of the BESA Divided by Condition.

Condition	Participant	Phonology		Morphosyntax		Semantics	
		English PR (SS)	**Spanish PR (SS)**	**English PR (SS)**	**Spanish PR (SS)**	**English PR (SS)**	**Spanish PR (SS)**
Blocking: Spanish First	BTP01	0.4 (60)	9 (80)	0.4 (60)	2 (70)	1 (62)	5 (75)
	BTP07	2 (70)	2 (70)	1 (62)	1 (62)	7 (78)	16 (85)
	BTP08	<0.1 (<55)	<0.1 (<55)	0.2 (58)	1 (62)	9 (80)	4 (73)
Blocking: English First	BTP03	0.4 (60)	0.4 (60)	4 (73)	1 (62)	21 (88)	16 (85)
	BTP12	0.1 (55)	0.4 (60)	0.1 (55)	0.4 (60)	13 (83)	7 (78)
	BTP13	84 (115)	50 (100)	4 (73)	1 (65)	7 (78)	9 (80)
Bridging	BTP04	9 (80)	5 (75)	2 (68)	2 (68)	7 (78)	21 (88)
	BTP05	0.4 (60)	1 (65)	1 (62)	0.2 (58)	2 (70)	9 (80)
	BTP10	9 (80)	16 (86)	1 (62)	4 (73)	5 (75)	13 (83)
Mean Scores (across all participants)		3 (71)	3 (72)	1 (64)	1 (65)	6 (77)	10 (81)

Note. Percentile ranks (PR) are displayed with standard scores (SS) in parentheses.

Materials

The treatment materials included the Spanish and English versions of six books with five target words per book for a total of 30 words. Each book had two versions: an English version and a Spanish version yielding 30 English words and their Spanish translation equivalents. The books and vocabulary words included a narrative book used by Restrepo et al. (2013), and five narrative books on culturally Hispanic relevant topics used by Mendez et al. (2015). The selection of vocabulary by Mendez et al. (2015) included Tier 1, high-frequency words (i.e., basic words that rarely require instruction; Beck, McKeown, & Kucan, 2002), that the literature suggests many ELLs do not have in their core L2 lexicon, as well as Tier 2, medium-high-frequency words. Restrepo et al. (2013) used vocabulary words that were at the Tier 2 level for bilingual preschool children with language impairments, as agreed upon by four researchers. Additional details on the selection of the vocabulary included: the vocabulary in Spanish was based on the Mexican dialect (which was the dialect of the participants in this study), the use of cognates was not avoided (e.g. "capa" and "cape"), and the verb tense in English did not always

match the verb tense in Spanish based on how the story was written in the books in each language.

The six books were divided into two sets of three books. Books were randomized to a treatment or control condition. Two participants in each condition were assigned to the same set of three books and the same set of experimental vocabulary words (Set 1) while the third participant was assigned to a different set of three books and experimental words (Set 2). The vocabulary words for Set 2 served as the control words for the participants receiving the experimental words in Set 1. In the same way, Set 1 served as the control words for the participant receiving Set 2 of experimental words. Refer to Table 4 for the books that were utilized in the current study, the vocabulary words selected for each book, the frequency count for each word, as well as how the books were paired. The frequency count for each word was determined using the CLEARPOND (Cross-Linguistic Easy-Access Resource for Phonological Orthographic Neighborhood Densities) database, which provides the phonological and orthographic neighborhood densities for a variety of languages, including Dutch, English, French, German and Spanish (Marian, Bartolotti, Chabal, & Shook, 2012). The books were paired by matching, as closely as possible, the vocabulary words based on category (i.e., nouns and verbs), since nouns are typically easier for children to learn than verbs (Eyer, Leonard, Bedore, McGregor, & Anderson, 2002; Piccin & Waxman, 2007). An independent samples *t*-test was conducted to compare word frequency for the words in English and Spanish in Sets 1 and Sets 2, since each set served as the control for the other set. There was not a significant difference in the word frequency estimates between Set 1 ($M = 5.44$, $SD = 5.87$) and Set 2 ($M = 7.22$, $SD = 8.23$); $t(28) = -.685$, $p = .499$ for the words in English. In addition, there was not a

significant difference in the word frequency estimates between Set 1 (M = 7.38, SD = 6.83) and Set 2 (M = 3.72, SD = 4.70); $t(28) = 1.71$, $p = .099$ for the words in Spanish.

Table 4. Book Pairings and Selected Vocabulary

	Set 1		**Set 2**	
Book Pair 1	**Growing Up With Tamales** ***Los Tamales de Ana***		**The Little Red Hen** ***La Gallinita Roja***	
	English	Spanish	English	Spanish
Vocabulary and Word Frequency (in parenthesis)	cornhusk (0) smear (2.18) tongs (0.78) handlebars (0.51) apron (2.67)	hoja de maíz (0) untar (0) pinzas (3.49) manubrio (0.82) delantal (2.21)	shed (10.98) wheat (5.75) beak (2.1) wheelbarrow (0.61) oven (8.88)	cobertizo (3.70) trigo (5.05) pico (13.82) carretilla (1.8) horno (13.97)
Frequency Mean	1.23	1.30	5.66	7.67
Frequency SD	1.14	1.52	4.38	5.80
Frequency Range	0-2.67	0-3.49	0.61-10.98	1.8-13.82
Book Pair 2	**Floppy in the Dark** ***Floppy en la Oscuridad***		**Sip, Slurp, Soup, Soup** ***Caldo, Caldo, Caldo***	
	English	Spanish	English	Spanish
Vocabulary and Word Frequency (in parenthesis)	cape (8.24) tremble (2.24) tent (17.49) melted (3.94) flashlight (5.92)	capa (15) temblar (3.13) tienda de campaña (0) derretir (1.11) linterna (10.24)	stewpot (0) slicing (1) ladle (0.75) embraces (0.61) bowl (21.45)	olla (4.47) picar (2.74) cucharon (0) abraza (3) tazón (0)
Frequency Mean	7.57	5.89	4.76	2.04
Frequency SD	5.98	6.46	9.34	1.98
Frequency Range	2.24-17.49	0-15	0-21.45	0-4.47
Book Pair 3	**It's Bedtime, Cucuy** ***A la Cama, Cucuy***		**The Party for Papá Luis** ***La Fiesta Para Papá Luis***	
	English	Spanish	English	Spanish
Vocabulary and Word Frequency (in parenthesis)	tugging (0.41) shout (16.45) brow (1.84) whispers (5.49) sheep (13.43)	jalando (0) grita (10.82) ceja (1.54) susurra (1.37) ovejas (6.11)	counting (21.47) blending (0.51) cage (20.27) grinning (1.45) pole (12.59)	contando (17.88) mezclando (1.35) jaula (14.06) sonriendo (8.46) palo (20.36)
Frequency Mean	7.52	3.97	11.26	12.42
Frequency SD	7.10	4.47	9.99	7.64
Frequency Range	0.41-16.45	0-10.82	0.51-21.47	1.35-20.36
Total # of Nouns (for each set)	9		10	
Total # of Verbs (for each set)	6		5	

Procedure

A single-subject, modified multiple-baseline design was utilized in the current study, which consisted of the randomization of the nine participants to one of the three treatment

conditions (i.e., Blocking: English First, Blocking: Spanish First, or Bridging) and assigning each participant to a different baseline length in each condition. The baseline lengths differed in the number of baseline data points obtained, which were a minimum of four, five, or six in each language. In each condition, the participants were randomly assigned to either four, five, or six baseline points. However, treatment did not begin unless the baseline remained stable in the naming task; that is, the children's naming of the words did not increase after a certain point, particularly during the last two to three baseline sessions. Comprehension data were also taken during baseline. However, the comprehension data were highly variable, making it difficult to judge stability at baseline. Consequently, only naming data were used to judge baseline stability. For this reason, the naming data should be thought of as the primary outcome variable and the comprehension data should be taken as the secondary outcome variable.

There are three reasons why this modified multiple baseline design was used. First is due to the fact that the treatment would last a minimum of seven weeks, which would be a very long baseline for the participant following the first participant, and which would create an even longer baseline for the third participant in each condition. A baseline of seven to 14 weeks was undesirable because, with the treatment portion of the study lasting a minimum of seven weeks, working with a participant for up to 21 weeks would make for a very long study, which would be difficult to complete due to time constraints. Second, whereas the ideal scenario would be to locate all nine participants at once, the concern existed that this may not be possible and, instead, the participants would be located at different points in time. As a result, a nonconcurrent multiple baseline design (Byiers, Reichle, & Symons, 2012) was used, in which the three subjects in each condition were not running at the same time. Finally, this method was intended

to demonstrate that changes in the data would occur due to the implementation of treatment (treatment effects) and not based on a specific number of testing points (test effects).

All nine of the participants were individually tested receptively and expressively in English and Spanish on the vocabulary words (experimental and control) using examiner-developed probes, which were presented using a laptop computer. The expressive task was a naming task and the procedure for this task was similar to the one used by Lugo-Neris et al. (2010). The child was asked to label a picture following a prompt, such as, "What did the boy do?/"Que hizo el niño?" for verbs and "What is this?"/"Que es esto?" for nouns. The receptive vocabulary probe included the target picture presented in a picture plate containing four other pictures. The arrangement of the pictures included three pictures on the top and two on the bottom. Pictures of the control words were intermixed with the experimental words (for each book pairing). For example, the experimental words from the *The Little Red Hen* were intermixed with the control words from *Growing Up With Tamales,* such that the top three pictures included two experimental words and one control word, and the bottom two included one experimental word and one control word. The children had to point to the picture that corresponded to the word named (i.e., "Show me ___"; "Enseñame ____"). The same pictures were used for the naming and comprehension tasks. Furthermore, these pictures were also used during treatment. The tasks were presented in the same order for all the participants, in both languages: naming and pointing to the picture named (comprehension). The naming and comprehension tests were always administered in English and Spanish on separate days (one language per day). In addition, on the naming tasks, the participants had to respond in the language of administration in order to receive a correct score. If the child responded in English during testing in Spanish or vice versa, the child was encouraged to respond in the other

language. All testing in English and Spanish was conducted by the primary investigator, who is a fluent bilingual speaker in English and Spanish, and all of the testing sessions (in English and Spanish) were audio- and video-recorded.

During baseline sessions, the participants were assessed in the naming and comprehension of all 15 experimental and 15 control words in each language. Therefore, during baseline sessions, the children were presented with 30 pictures for the naming task and 30 picture plates for the comprehension task. Following the treatment, an immediate post-test of the naming and comprehension of all 15 experimental and 15 control words was administered to the participants in each language. In addition, one week after the immediate post-test, an additional follow-up post-test of the naming and comprehension of all 15 experimental and 15 control words was given to the participants to assess maintenance.

Treatment Format

The treatment format for the current project borrowed from the methods used in Storkel et al.'s (2017) and Restrepo et al.'s (2013) vocabulary learning studies. Depending on the number of days the children were seen per week (three to four) the intervention took place for a minimum of six and-a-half weeks for a total of 26 sessions, which included a minimum of six weeks of vocabulary instruction and two days of review immediately following treatment. The participants received treatment three to four days per week for approximately 20 minutes per session in a one-on-one format in a quiet area in the child's school or home. A total of three books (English and Spanish versions) were used for each participant. During the first three weeks of treatment, one book (English and Spanish version) was read per week and five target words in each language were taught through the provision of definitions, context sentences, and synonyms. The sequence was then repeated with the same books in the same order for the next

three weeks. Following the six weeks of treatment, the first two days of the next week were review sessions, in which the target vocabulary words taught in the previous six weeks (15 words in each language) were reviewed, one day in English and one day in Spanish.

In Table 5 below, an example is provided of the evaluation, treatment, and testing procedures for participants in the Blocking: Spanish First condition with a baseline length of four data points. During Week 1, the participants were evaluated using formal measures and their hearing was screened. The participants were then tested in the naming and comprehension of all the words in Spanish and English during Weeks 2 and 3, beginning with testing in Spanish on the first day of Week 2, followed by English on the second day of Week 2 and so on until the end of Week 3 when baseline data were collected in both languages for four data points. In Week 4, the treatment was initiated, beginning with all Spanish on the first day (i.e., the storybook, vocabulary, and testing were all in Spanish), followed by a session all in English (i.e., the storybook, vocabulary, and testing were all in English) on the second day, and so on until the end of Week 9. In the first two days of Week 10, the vocabulary was reviewed, one day in Spanish and one day in English. Following the review, an immediate post-test was then administered to the participants, one day in Spanish and one day in English during Week 10. One week later, during Week 11, the participants were given an additional post-test, one day in Spanish and one day in English.

Table 5. Summary Table: Example of evaluation, treatment, and testing procedures for baseline of four data points for the Blocking: Spanish First condition.

Week 1	Administration of BESA (Spanish) and hearing screening	Administration of BESA (English) and RIAS		
Week 2	Baseline 1 (Spanish): Test naming and comprehension of experimental and control words.	Baseline 1 (English): Test naming and comprehension of experimental and control words.	Baseline 2 (Spanish): Test naming and comprehension of experimental and control words.	Baseline 2 (English): Test naming and comprehension of experimental and control words.
Week 3	Baseline 3 (Spanish): Test naming and comprehension of experimental and control words.	Baseline 3 (English): Test naming and comprehension of experimental and control words.	Baseline 4 (Spanish): Test naming and comprehension of experimental and control words.	Baseline 4 (English): Test naming and comprehension of experimental and control words.
Week 4	Tx Session 1: Book 1 (Spanish); Test naming and comprehension (Spanish)	Tx Session 2: Book 1 (English); Test naming and comprehension (English)	Tx Session 3: Book 1 (Spanish); Test naming and comprehension (Spanish)	Tx Session 4: Book 1 (English); Test naming and comprehension (English)
Week 5	Tx Session 5: Book 2 (Spanish); Test naming and comprehension (Spanish)	Tx Session 6: Book 2 (English); Test naming and comprehension (English)	Tx Session 7: Book 2 (Spanish); Test naming and comprehension (Spanish)	Tx Session 8: Book 2 (English); Test naming and comprehension (English)
Week 6	Tx Session 9: Book 3 (Spanish); Test naming and comprehension (Spanish)	Tx Session 10: Book 3 (English); Test naming and comprehension (English)	Tx Session 11: Book 3 (Spanish); Test naming and comprehension (Spanish)	Tx Session 12: Book 3 (English); Test naming and comprehension (English)
Week 7	Tx Session 13: Book 1 (Spanish); Test naming and comprehension (Spanish)	Tx Session 14: Book 1 (English); Test naming and comprehension (English)	Tx Session 15: Book 1 (Spanish); Test naming and comprehension (Spanish)	Tx Session 16: Book 1 (English); Test naming and comprehension (English)
Week 8	Tx Session 17: Book 2 (Spanish); Test naming and comprehension (Spanish)	Tx Session 18: Book 2 (English); Test naming and comprehension (English)	Tx Session 19: Book 2 (Spanish); Test naming and comprehension (Spanish)	Tx Session 20: Book 2 (English); Test naming and comprehension (English)
Week 9	Tx Session2 1: Book 3 (Spanish); Test naming and comprehension (Spanish)	Tx Session 22: Book 3 (English); Test naming and comprehension (English)	Tx Session 23: Book 3 (Spanish); Test naming and comprehension (Spanish)	Tx Session 24: Book 3 (English); Test naming and comprehension (English)
Week 10	Review Session (Spanish)	Review Session (English)	Immediate Post-Test (Spanish): Test naming and comprehension of experimental and control words	Immediate Post-Test (English): Test naming and comprehension of experimental and control words
Week 11			Follow-up Post-Test (Spanish): Test naming and comprehension of experimental and control words	Follow-up Post-Test (English): Test naming and comprehension of experimental and control words

The evaluation, treatment, and testing procedures for participants in the Blocking: English First condition differed from what is displayed in Table 5 only in the order of the presentation of the languages, which was the opposite of the Blocking: Spanish First condition. For participants in the Blocking: English First condition, beginning in Weeks 2 and 4, English was always the language presented first, followed by Spanish the next day, and so on. When the vocabulary was reviewed in Week 10, the vocabulary was reviewed in English first, followed by Spanish the next day. In addition, immediate and follow-up post-testing of the vocabulary always began with English, followed by testing in Spanish the next day.

The evaluation, treatment, and testing procedures for participants in the Bridging condition were the same as the Blocking: Spanish First condition in Weeks 1, 2, 3, 10, and 11. However, during weeks 4 through 9, although the storybook, vocabulary, and testing were also presented as displayed in Table 5, both English and Spanish were used during each treatment session, with the ratio of the languages alternating per day, such that on the days indicated with "Spanish", more Spanish was used than English and on the days indicated with "English", English was the majority language used during that session.

Across all three conditions, the treatment intensity and semantic content were held constant. During the book reading sessions, each subject received eight exposures per word per session, for a total of 32 exposures per word by the end of treatment (8 exposures per session x 4 sessions = 32 exposures). Additional exposures (n = 4) were provided in a slightly different manner during the review session, yielding 36 total exposures per word at the end of treatment. This is a higher number of exposures than has been utilized in previous studies with typical ELLs. Since children with SLI have more difficulty learning vocabulary, the amount of exposures used with typically-developing ELLs is probably not going to be sufficient. During a

book reading session, the eight exposures were provided before, during, and after the reading of the storybooks and consisted of the target words used in the text (one exposure), the definition of the target word (two exposures), a synonym of the target word (three exposures), and target word used in a context sentence (two exposures). During the review days, all 15 experimental words were presented one at time with a corresponding picture. Two context sentences, a synonym, and a definition were provided for each word as it was presented, for an additional four exposures per word. With the exception of the picture of the word from the book, all the pictures of the vocabulary were presented on a laptop computer screen during the treatment and testing sessions.

During treatment sessions, the participants were tested on the naming and comprehension of the five experimental and five control words assigned for that week at the end of each session (i.e., 10 pictures for the naming task and 10 picture plates for the comprehension task). No testing took place during the two days of review sessions. A script was created that the primary investigator strictly followed while working with the participants. All treatment sessions were videotaped.

Although the intensity was the same across the treatment conditions, the use of Spanish and English varied. This is illustrated in Tables 6-9 for the target word "whispers/susurra". Tables 6 and 7 show the book reading activities for the blocking conditions for a Spanish day (Table 6) and an English day (Table 7). In contrast, Tables 8 and 9 show the book reading activities for the Bridging condition for a Spanish dominant day (Table 8) and an English dominant day (Table 9). Notice that the number of exposures to the target word (n = 8) is the same across all four tables and the type of information provided (book text, definition, synonym, context sentence) is the same across all four tables. The only difference across tables is in the

use of Spanish and English. Specifically, the two languages were kept separate in the blocking conditions, whereas they were intermixed in the Bridging condition.

Table 6. Sample Lesson for "susurra" (Book: A la Cama, Cucuy!) in ***Blocking: Spanish First condition***, Day 1 (Spanish)

Preview (Definition + Synonym + Context) **SAY:** "Vamos a ver algunas de las palabras que vamos a escuchar en nuestro libro de cuento."			
SHOW Definition Picture	**SAY Definition**	**SAY Synonym**	**SAY Context**
P 1.	**Susurra** significa decir algo en voz baja.	**Susurra** es como hablar calladamente.	El **susurra** en su oído para que nadie pueda escuchar.
Book Reading (Text + Synonym + Definition) **SAY:** "Vamos a leer nuestro libro de cuento y escuchar por esas palabras!"			
SHOW Book Picture	**READ Text**	**SAY Synonym**	
Page 23	"'Porque necesitas descansar,' Mamá le **susurra** en el oído."	**Susurra** es como hablar calladamente.	
Review (Naming + Context + Definition) **SAY:** "Vamos a pensar sobre las palabras diferentes de nuestro libro de cuento."			
SHOW Context Picture	**SAY Context**	**SAY Synonym**	**SAY Definition**
R 1.	La niña **susurra** un secreto en su oído.	**Susurra** es como hablar calladamente.	**Susurra** significa decir algo en voz baja.

Table 7. Sample Lesson for "whispers" (Book: It's Bedtime, Cucuy!) in ***Blocking: Spanish First condition***, Day 2 (English)

Preview (Definition + Synonym + Context) **SAY:** "Let's look at some of the words we'll hear in our storybook."			
SHOW **Definition Picture**	**SAY Definition**	**SAY Synonym**	**SAY Context**
P 1.	**Whispers** means to say something in a low voice.	**Whispers** is like talk quietly.	He **whispers** in her ear so that no one will hear him.
Book Reading (Text + Synonym) **SAY:** "Let's read our storybook and listen for those words!"			
SHOW **Book Picture**	**READ Text**	**SAY Synonym**	
Page 26	"'Because you need to rest,' Mamá **whispers** in his ear."	**Whispers** is like talk quietly.	
Review (Naming + Context + Definition) **SAY:** "Let's think about the different words from our storybook."			
SHOW **Context Picture**	**SAY Context**	**SAY Synonym**	**SAY Definition**
R 1.	The girls **whispers** a secret in her ear.	**Whispers** is like talk quietly.	**Whispers** means to say something in a low voice.

Table 8. Sample Lesson for "susurra" (Book: A la Cama, Cucuy!) in ***Bridging condition***, Day 1 (Spanish dominant)

Preview (Definition + Synonym + Context) **SAY:** "Vamos a ver algunas de las palabras que vamos a escuchar en nuestro libro de cuento."			
SHOW **Definition Picture**	**SAY Definition**	**SAY Synonym**	**SAY Context**
P 1.	**Susurra** significa decir algo en voz baja.	**Susurra** es como hablar calladamente.	He **susurra** in her ear so that no one will hear him.
Book Reading (Text + Synonym + Definition) **SAY:** "Vamos a leer nuestro libro de cuento y escuchar por esas palabras!"			
SHOW **Book Picture**	**READ Text**	**SAY Synonym**	
Page 23	"'Porque necesitas descansar,' Mamá le **susurra** en el oído."	**Susurra** is like talk quietly.	
Review (Naming + Context + Definition) **SAY:** "Vamos a pensar sobre las palabras diferentes de nuestro libro de cuento."			
SHOW **Context Picture**	**SAY Context**	**SAY Synonym**	**SAY Definition**
R 1.	La niña **susurra** un secreto en su oído.	**Susurra** es como hablar calladamente.	**Susurra** means to say something in a low voice.

Table 9. Sample Lesson for "whispers" (Book: It's Bedtime, Cucuy!) in ***Bridging condition***, Day 2 (English dominant)

Preview (Definition + Synonym + Context) **SAY:** "Let's look at some of the words we'll hear in our storybook."			
SHOW Definition Picture	**SAY Definition**	**SAY Synonym**	**SAY Context**
P 1.	**Whispers** means to say something in a low voice.	**Whispers** is like talk quietly.	El **whispers** en su oído para que nadie pueda escuchar.
Book Reading (Text + Synonym + Definition) **SAY:** "Let's read our storybook and listen for those words!"			
SHOW Book Picture	**READ Text**	**SAY Synonym**	
Page 23	"'Because you need to rest,' Mamá **whispers** in his ear."	**Whispers** es como hablar calladamente.	
Review (Naming + Context + Definition) **SAY:** "Let's think about the different words from our storybook."			
SHOW Context Picture	**SAY Context**	**SAY Synonym**	**SAY Definition**
R 1.	The girls **whispers** a secret in her ear.	**Whispers** is like talk quietly.	**Whispers** significa decir algo en voz baja.

Fidelity and Reliability

In order to determine treatment fidelity, three randomly selected videos of treatments in which the storybook was read in Spanish and three randomly selected videos of treatments in which the storybook was read in English for each participant were scored by another person who, although was not a fluent speaker of Spanish, had good comprehension skills in Spanish. A percent correct score was obtained for the total number of exposures provided throughout the treatment session. In addition, a percent correct score was obtained for the prompt and picture fidelity of the treatment form. Fidelity for the total number of exposures provided during the treatment session was an average of 99.95% and fidelity for prompt and picture fidelity was an average of 99.89%. Coding reliability was not conducted in this study because all relevant data were double-scored by the same person who assessed treatment fidelity. However, the same

person who assessed reliability for treatment fidelity also double-scored all the testing sessions in this study, including the testing done during the evaluation sessions, the baseline sessions, the treatment sessions, and the post-testing sessions. Disagreements that were encountered were resolved by consensus.

Analysis

Data points were collected for each participant and individual graphs were created for each participant, plotting the number of vocabulary words (experimental and control) correctly comprehended and named at each time point. Each participant has two graphs corresponding to the naming of vocabulary in English and Spanish and the comprehension of vocabulary in English and Spanish. The Tau-*U* metric effect size calculator (Vannest, Parker, & Gonen, 2011) was used to determine significance and effect sizes from the first treatment to the first post-test for the naming and comprehension tasks in each language. Tau-*U* is a method used to measure nonoverlap data between two phases and is an index well-suited for small data sets, particularly when data are nonconforming, which is typical in single case research (Vannest et al., 2011). The Tau-*U* effect size calculation method has greater power and is more precise compared to other nonoverlapping effect size calculation methods. It addresses issues that are problematic for other effect size measures by adjusting for trend, which may result in modest, but important changes to the effect size, handling smaller data sets, discriminating well at the upper and lower limits, and correlating well with other indices (Vannest et al., 2011; Vannest & Ninci, 2015). In addition, for each condition, the Tau-*U* metric effect size calculator was used to determine significance and effect sizes for the weighted average of treatment versus no treatment for the three participants in each condition. Data from the first treatment to the first post-test were included in the analysis for the naming and comprehension tasks in each language. According to

Vannest and Ninci (2015), interpretation of an effect size is relative to client needs, intervention comparisons, and settings. However, a 0.20 improvement may be considered a small change, 0.20 to 0.60 a moderate change, 0.60 to 0.80 a large change, and above 0.80 a large to very large change. The current study followed these guidelines.

Chapter 3: Results

The purpose of the current study was to explore the effectiveness of three treatment methods aimed at increasing the vocabulary knowledge in English and Spanish of ELLs with SLI. The first aim of the study was to determine the effectiveness of each treatment condition (i.e., Blocking: Spanish First, Blocking: English First, and Bridging) based on the learning of the experimental versus control words for each participant in that condition, which were compared to one another within participant using the Tau-*U* metric effect size calculator (Vannest, Parker, & Gonen, 2011). The second aim was to compare the treatment conditions that were effective via descriptive analysis based on the weighted average of treatment versus no treatment for the participants in each condition using the Tau-*U* metric effect size calculator. This first part of this chapter will address the findings for each participant in the comprehension and naming tasks in each condition. The second part of this chapter will address the overall findings for each of the three conditions.

Aim 1

Two graphs were created for each participant in all of the conditions, one for comprehension and one for naming, plotting the number of vocabulary words (experimental and control) correctly comprehended or named at each time point in English and Spanish. In each graph, the line for the English treated words is solid blue, the line for the Spanish treated words is solid red, a blue, dotted line is for the English untreated words, and a red, dotted line represents the Spanish untreated words. The treated (experimental) words were compared with the untreated (control) words in each language with the Tau-*U* metric effect size calculator (Vannest, Parker, & Gonen, 2011) to determine significance and effect sizes. Data from the first treatment to the first post-test were included in the analysis for the naming and comprehension tasks in each language. Tau-*U* = 0.20 was considered a small effect size, Tau-*U* = 0.20 to 0.60 a

moderate effect size, Tau-*U* = 0.60 to 0.80 a large effect size, and a Tau-*U* above 0.80 a large to very large effect size.

Blocking: Spanish First Participants

Comprehension Task. Figures 1, 2, and 3 demonstrate the graphs for the comprehension task for the participants (BTP01, BTP07, and BTP08) in the Blocking: Spanish First condition. As shown in Figure 1, BTP01 showed no significant difference between the accuracy of the treated words and the untreated words in English, Tau-*U* = -0.52, moderate effect, 90% confidence interval (CI) [-1, 0.110], *p* = .1745. Likewise, BTP01 actually showed slightly better accuracy of the Spanish untreated words than the Spanish treated words, as indicated by the negative Tau-*U*, Tau-*U* = -0.84, very large effect, 90% CI [-1, -0.210], *p* = .0283. In contrast, the results for BTP07 (Figure 2) in the comprehension task demonstrated a significant difference between the accuracy of the treated and untreated words in English, Tau-*U* = 0.96, very large effect, 90% CI [0.330, 1], *p* = .0122, but not in Spanish, Tau-*U* = 0.24, moderate effect, 90% CI [-0.390, 0.870], *p* = .5309. BTP08 (Figure 3) showed a complementary pattern to BTP07. Specifically, BTP08 demonstrated a large effect size and significant difference in the accuracy of the treated and untreated words in Spanish, Tau-*U* = 0.76, 90% CI [0.130, 1], *p* = .0472, but not in English, Tau-*U* = 0.68, large effect, 90% CI [0.050, 1], *p* = .0758.

Figure 1. Comprehension graph for BTP01 in the Blocking: Spanish First condition, showing no significant learning in either language.

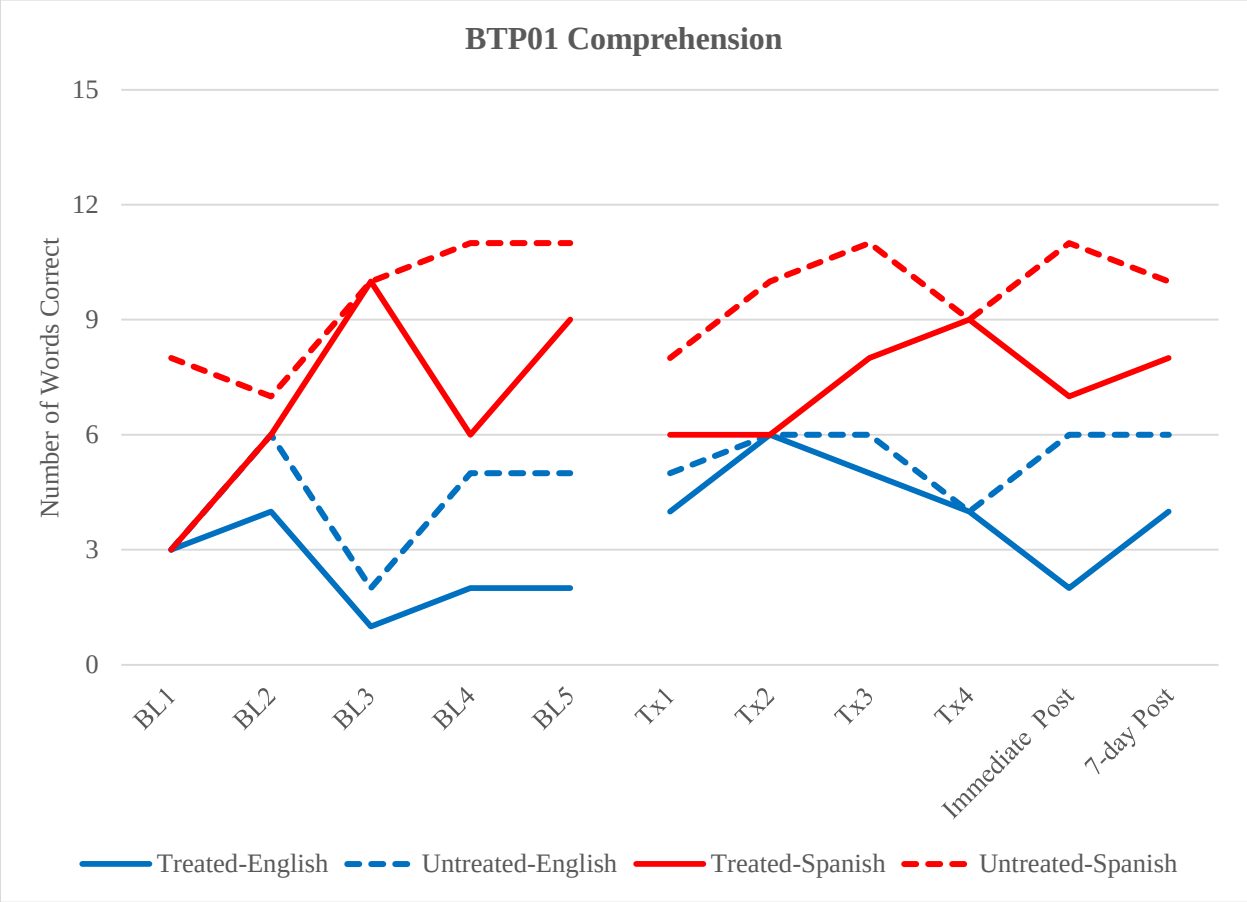


Figure 2. Comprehension graph for BTP07 in the Blocking: Spanish First condition, showing significant learning in English, but not in Spanish.

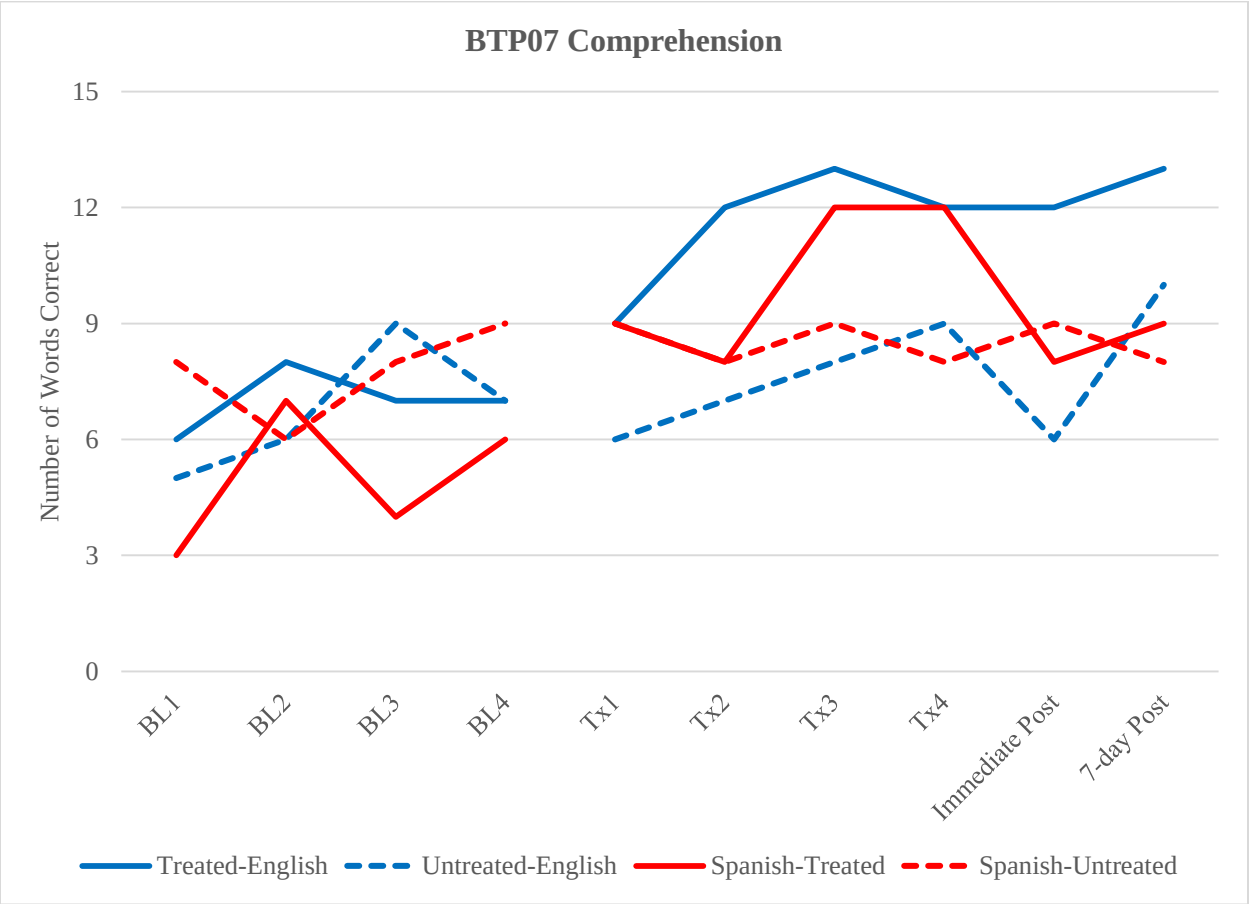
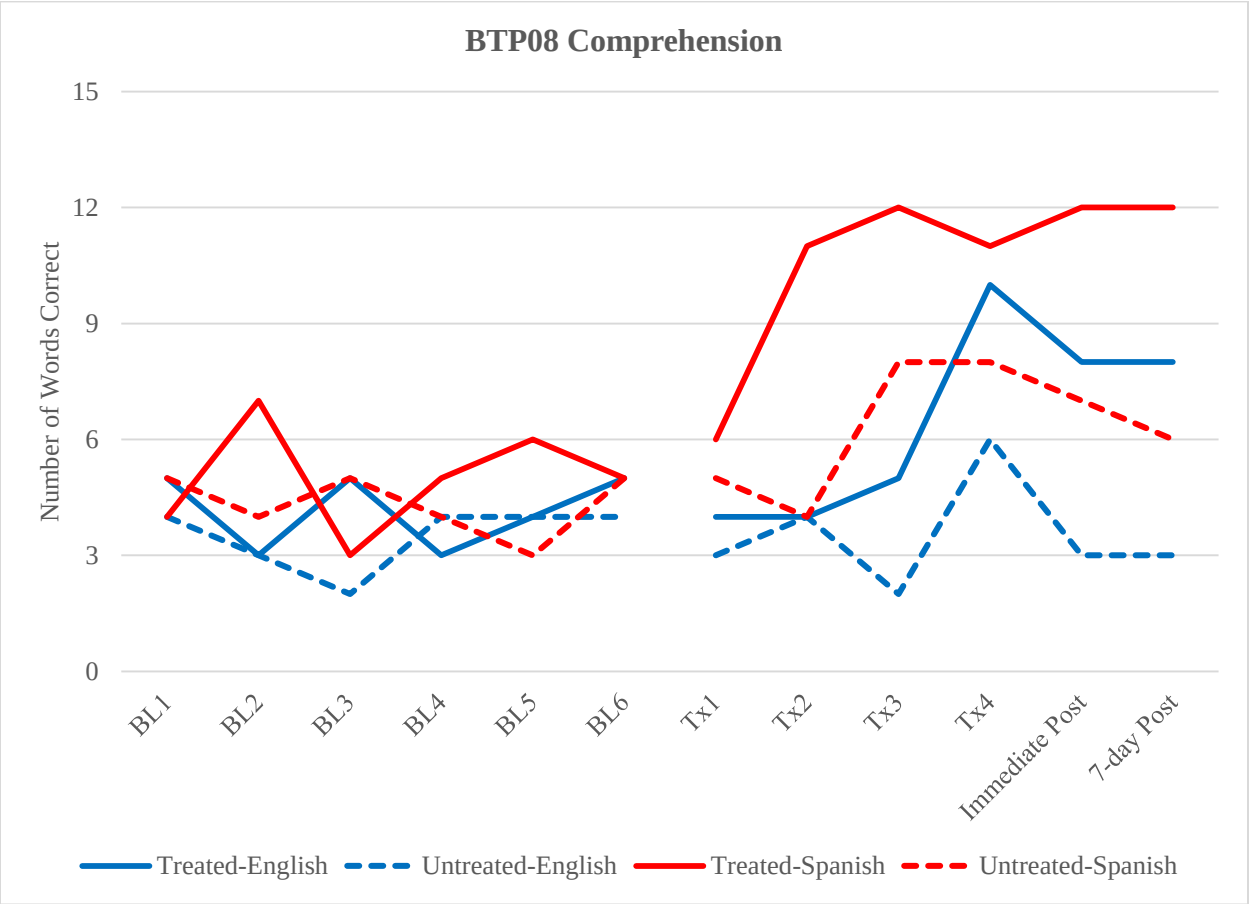


Figure 3. Comprehension graph for BTP08 in the Blocking: Spanish First condition, showing significant learning in Spanish, but not in English.



Naming Task. The graphs for the naming task for the participants in the Blocking: Spanish First condition are displayed in Figures 4, 5, and 6 below. Across all three participants, similar naming performance was observed for treated and untreated words in both languages. Specifically, the results for BTP01, in Figure 4, demonstrated no significant difference between the treated and untreated words in English, Tau-*U* = 0, no effect, 90% CI [-0.630, 0.630], *p* = 1, nor Spanish, Tau-*U* = -0.2, small effect, 90% CI [-0.830, 0.430], *p* = .6015. Based on the visual inspection of BTP07's graph (Figure 5), a large gap exists between the treated and untreated words in English, suggesting that naming for treated words may have been better than untreated words. Nevertheless, the statistical analysis revealed no significant difference between treated and untreated words for BTP07 either in English, Tau-*U* = 0.48, moderate effect, 90% CI [-

0.150, 1], p = .2101, nor Spanish, Tau-U = -0.2, small to moderate effect, 90% CI [-0.830, 0.430], p = .6015. Lastly, the results for BTP08 (Figure 6) revealed no significance between the treated versus untreated words in English, Tau-U = 0.6, moderate to large effect, 90% CI [-0.030, 1], p = .1172, or Spanish, Tau-U = 0.2, small to moderate effect, 90% CI [-0.430, 0.830], p = .6015.

Figure 4. Naming graph for BTP01 in the Blocking: Spanish First condition, showing no significant learning in either language.

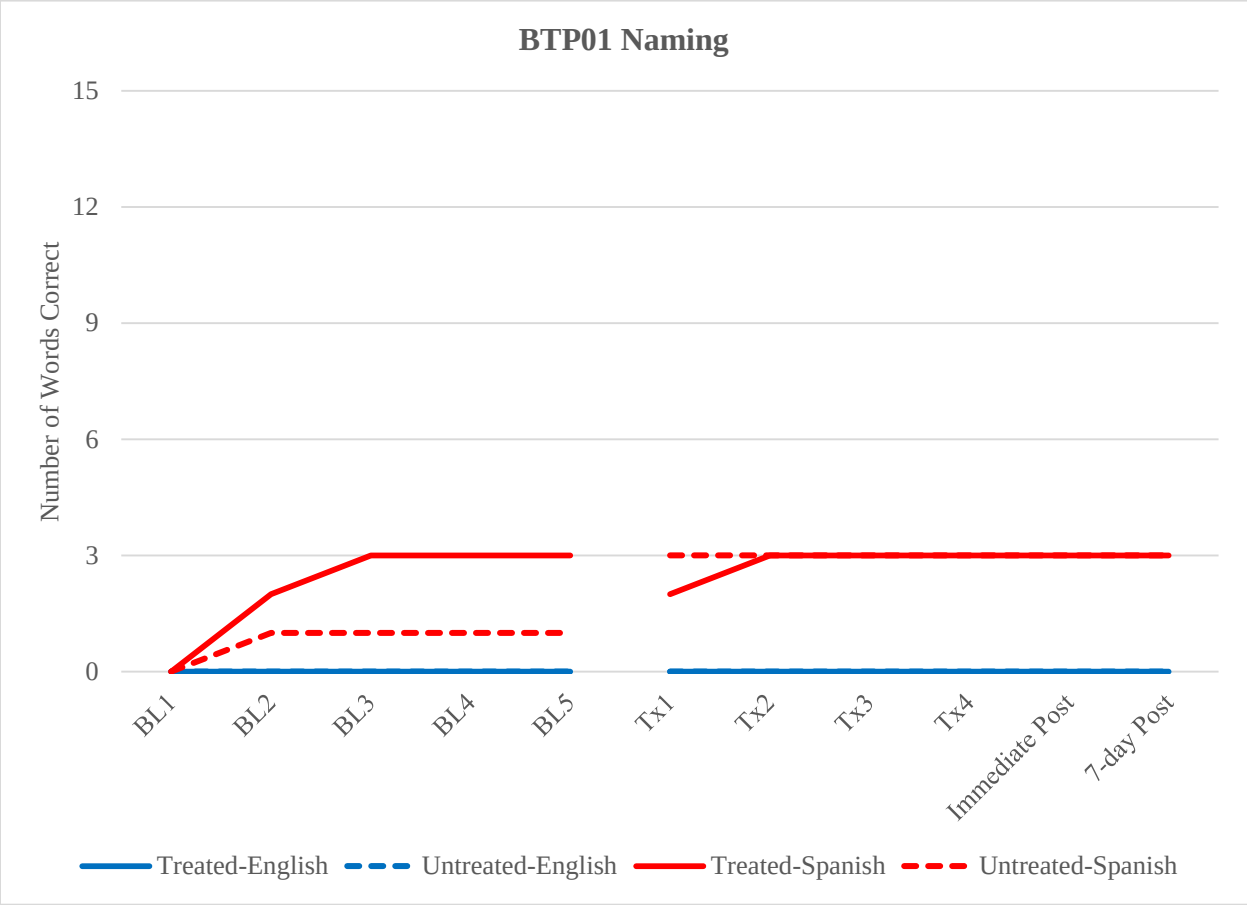


Figure 5. Naming Graph for BTP07 in the Blocking: Spanish First condition, showing no significant learning in either language.

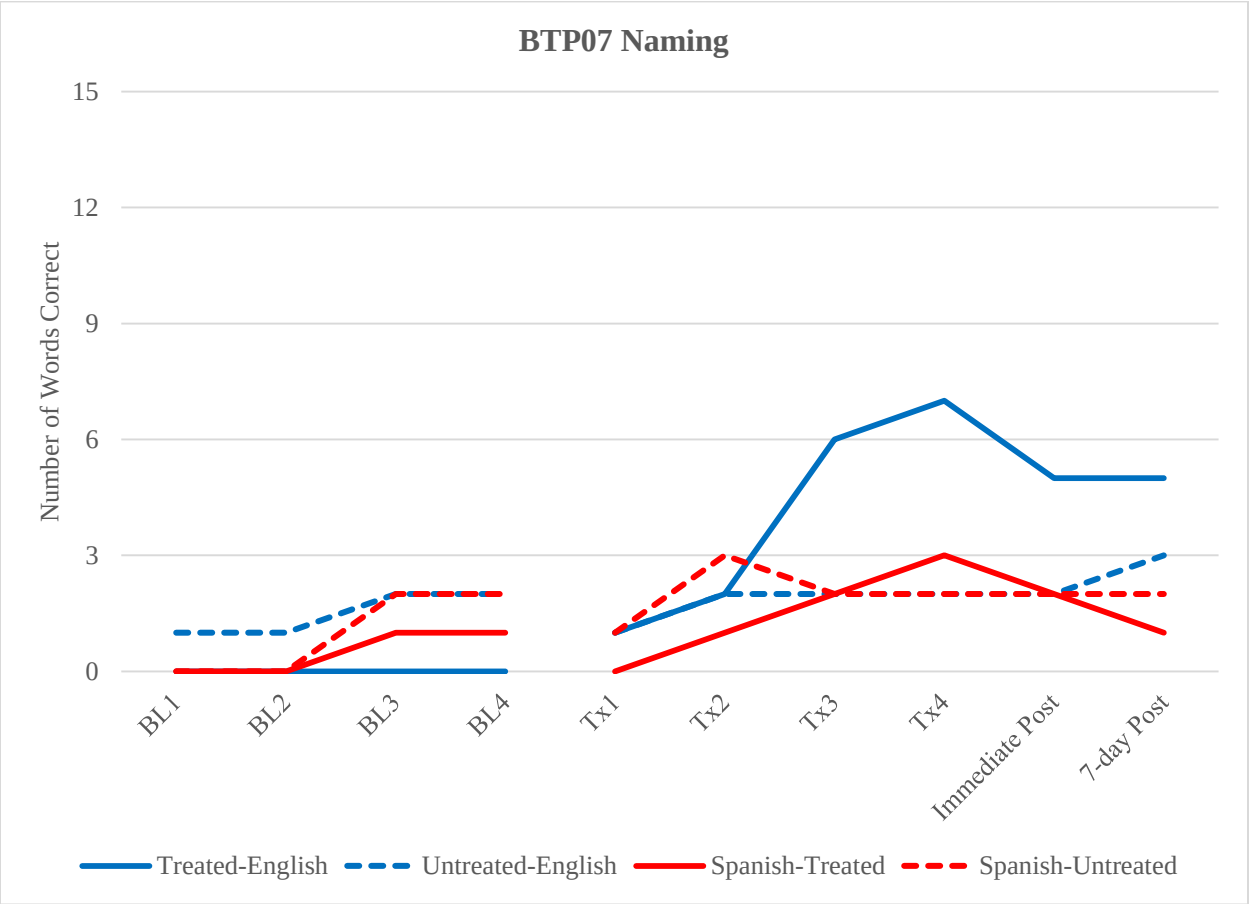
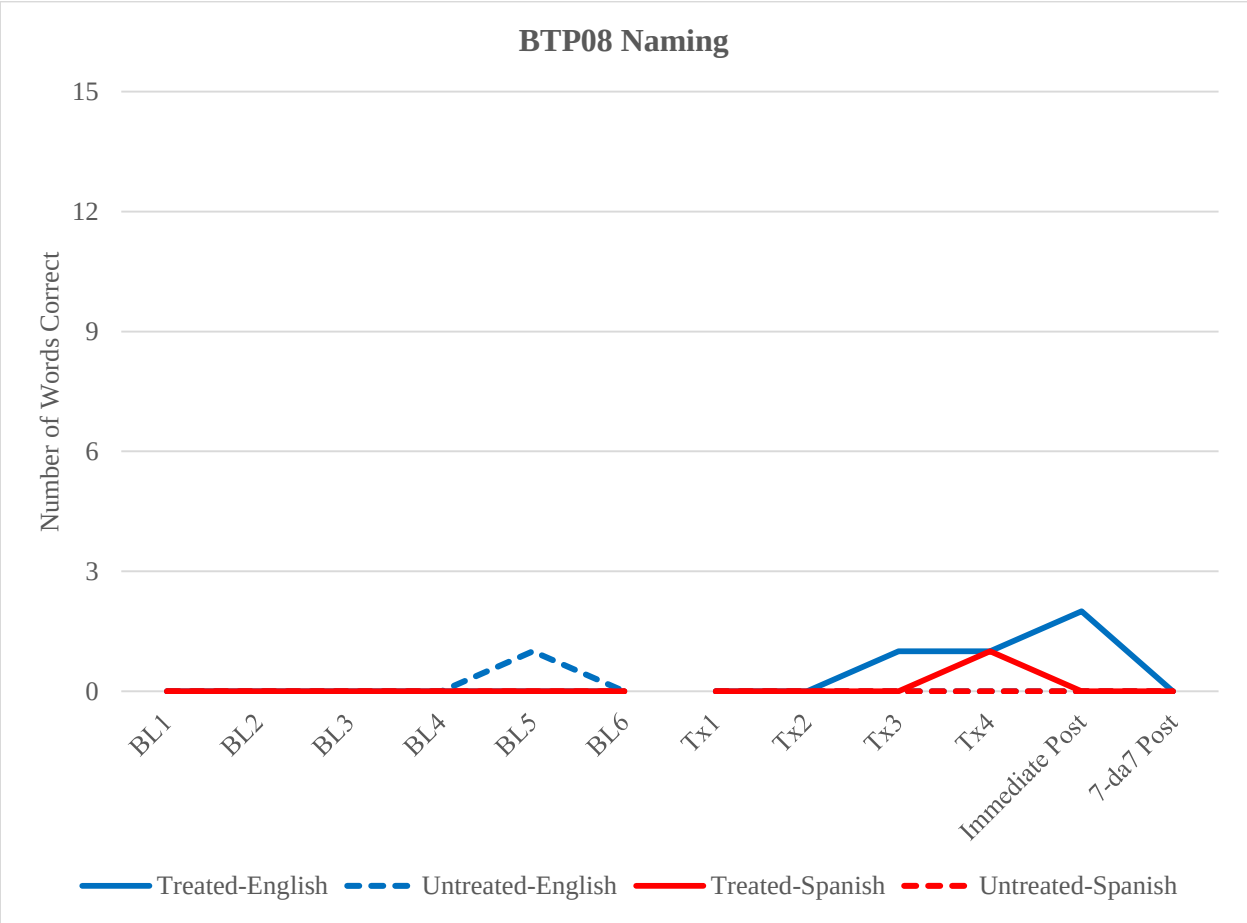


Figure 6. Naming graph for BTP08 in the Blocking: Spanish First condition, showing no significant learning in either language.



In summary, limited progress took place for the participants in the Blocking: Spanish First condition. Two out of the three participants demonstrated higher accuracy of the treated words versus the untreated words on the comprehension task in one of the two languages. However, across the two participants, accuracy was inconsistent, with one demonstrating progress only in English and the other only in Spanish. None of the participants showed any progress in the naming task in either language.

Blocking: English First Participants

Comprehension Task. The graphs for the comprehension task for the participants (BTP03, BTP12, and BTP13) in the Blocking: English First condition are displayed in Figures 7,

8, and 9 below. As shown in Figure 7, BTP03 demonstrated a large effect size and significant difference between the treated and untreated words in English, Tau-*U* = 0.76, 90% CI [0.130, 1], *p* = .0472, and a very large effect size and significant difference between the Spanish treated and untreated words, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009. Based on the visual inspection of BTP12's graph (Figure 8), a large gap exists between the treated and untreated words in English, suggesting that comprehension for treated words may have been better than untreated words. However, the statistical analysis revealed no significant difference between the treated and untreated words in English, Tau-*U* = 0.64, moderate effect, 90% CI [0.010, 1], *p* = .0947, nor Spanish, Tau-*U* = -0.68, moderate effect, 90% CI [-1, 0.050], *p* = .0758. Likewise, BTP13 (Figure 9) also did not demonstrate any significant difference between the accuracy for treated words in English, Tau-*U* = 0.72, large effect, 90% CI [0.090, 1], *p* = .0601, nor Spanish, Tau-*U* = -0.6, moderate to large effect, 90% CI [-1, 0.030], *p* = .1172.

Figure 7. Comprehension graph for BTP03 in the Blocking: English First condition, showing significant learning in both languages.

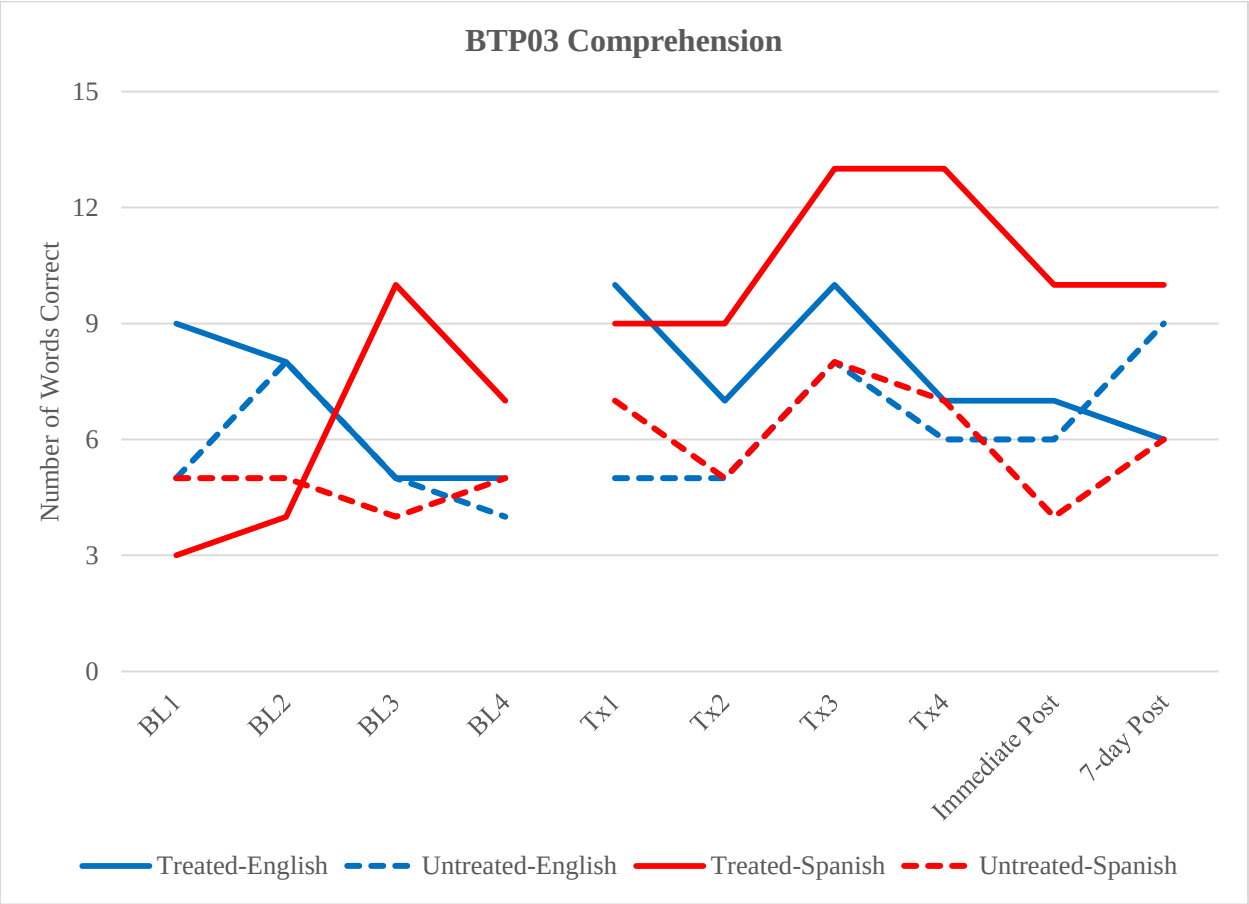


Figure 8. Comprehension graph for BTP12 in the Blocking: English First condition, showing no significant learning in either language.

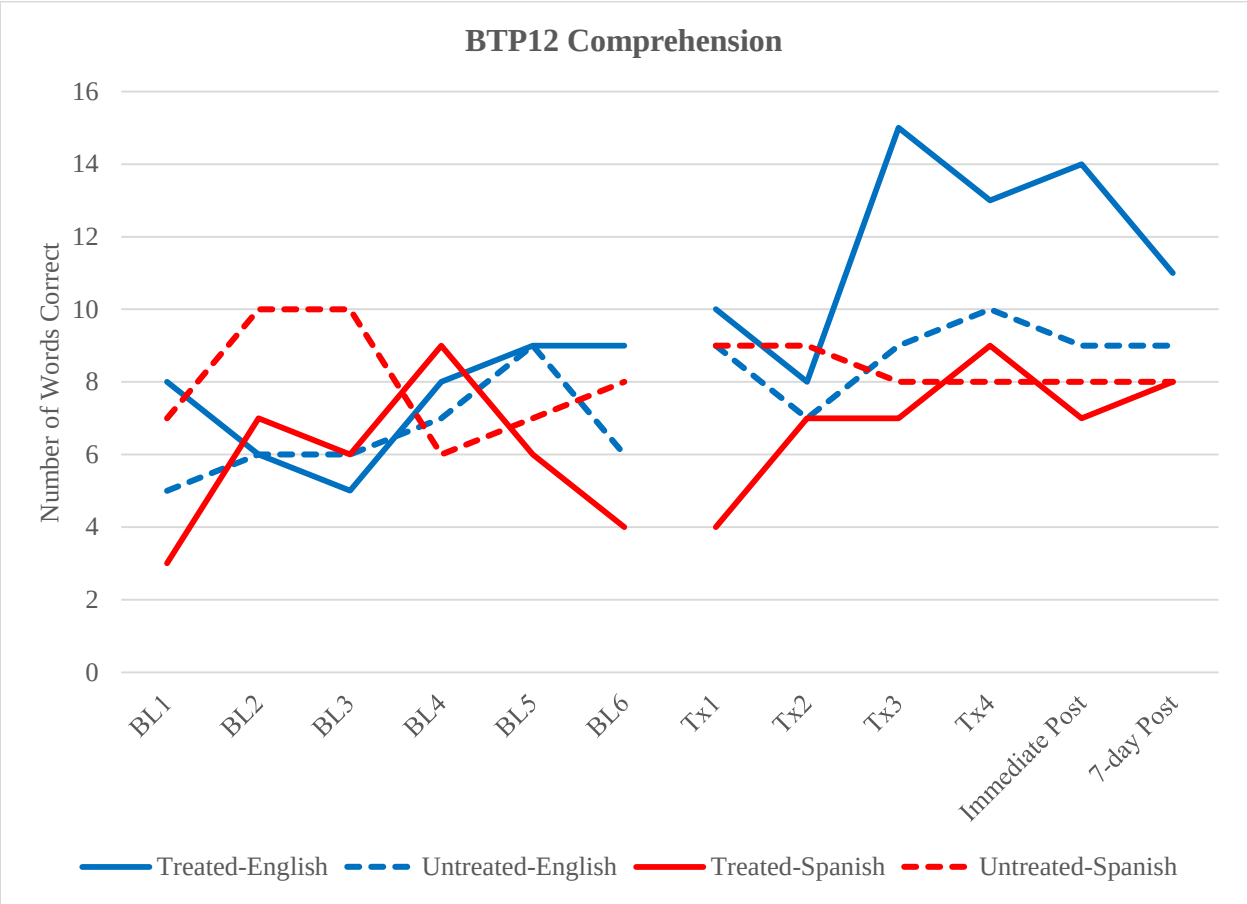
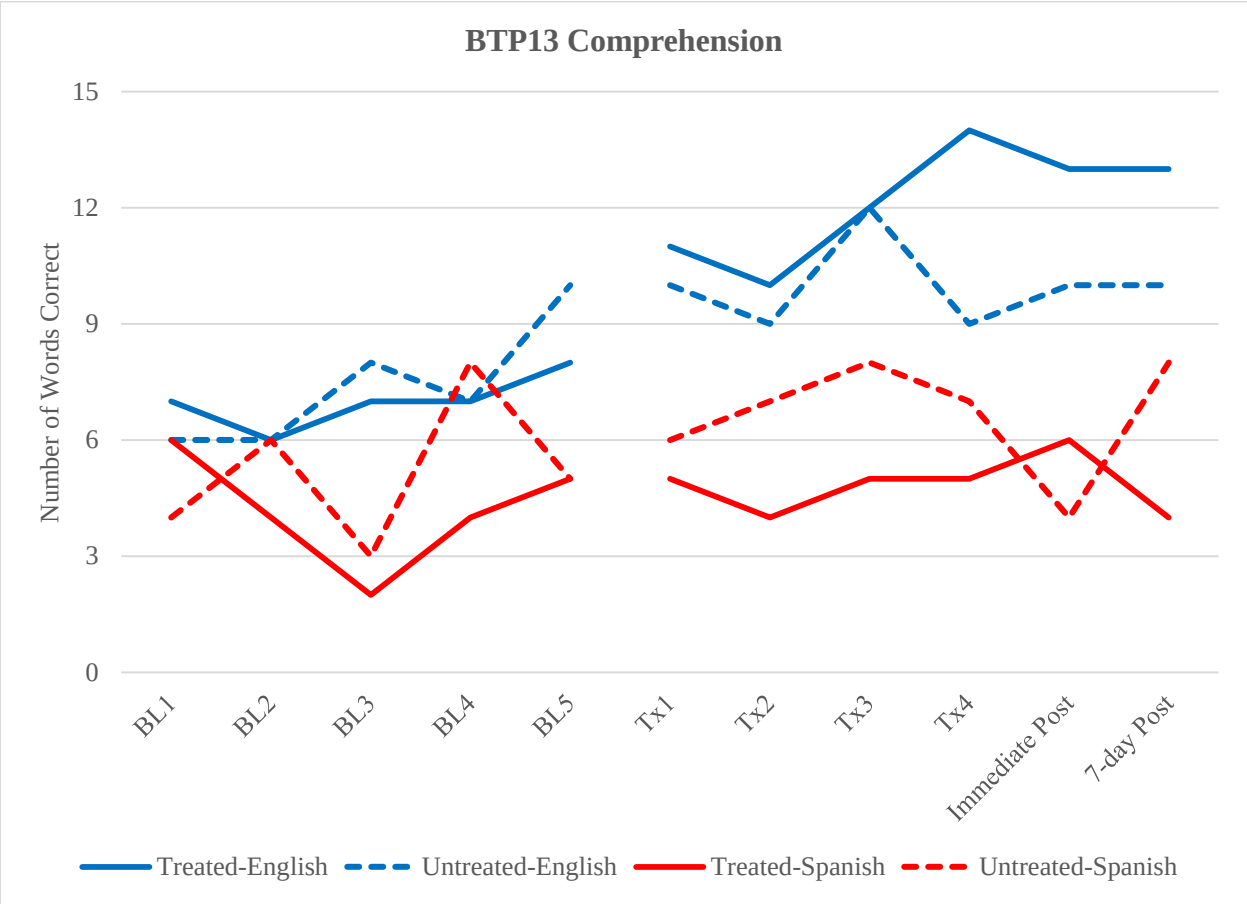


Figure 9. Comprehension graph for BTP13 in the Blocking: English First condition, showing no significant learning in either language.



Naming Task. In Figures 10, 11, and 12 below, the graphs for the naming task for the participants in the Blocking: English First Condition are displayed. As shown in Figure 10, BTP03 demonstrated a very large effect size and significant difference between the treated and untreated words in both English, Tau-*U* = 0.92, 90% CI [0.290, 1], *p* = .0163, and Spanish, Tau-*U* = 0.84, 90% CI [0.210, 1], *p* = .0283. Likewise, BTP12's (Figure 11) naming of the treated English words was significantly different from the naming of the untreated English words, Tau-*U* = 1, very large effect, 90% CI [0.370, 1], *p* = .009. However, no significant difference between the accuracy of the treated words versus the untreated words in Spanish took place for BTP12, Tau-*U* = 0.36, moderate effect, 90% CI [-0.270, 0.990], *p* = .3472. Similarly, the results for BTP13 (Figure 12) revealed a very large effect size and significant accuracy of the treated

words in English, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009, but no significant differences were found between the treated and untreated words in Spanish, Tau-*U* = 0, no effect, 90% CI [-0.630, 0.630], *p* = 1.

Figure 10. Naming graph for BTP03 in the Blocking: English First condition, showing significant learning in both languages.

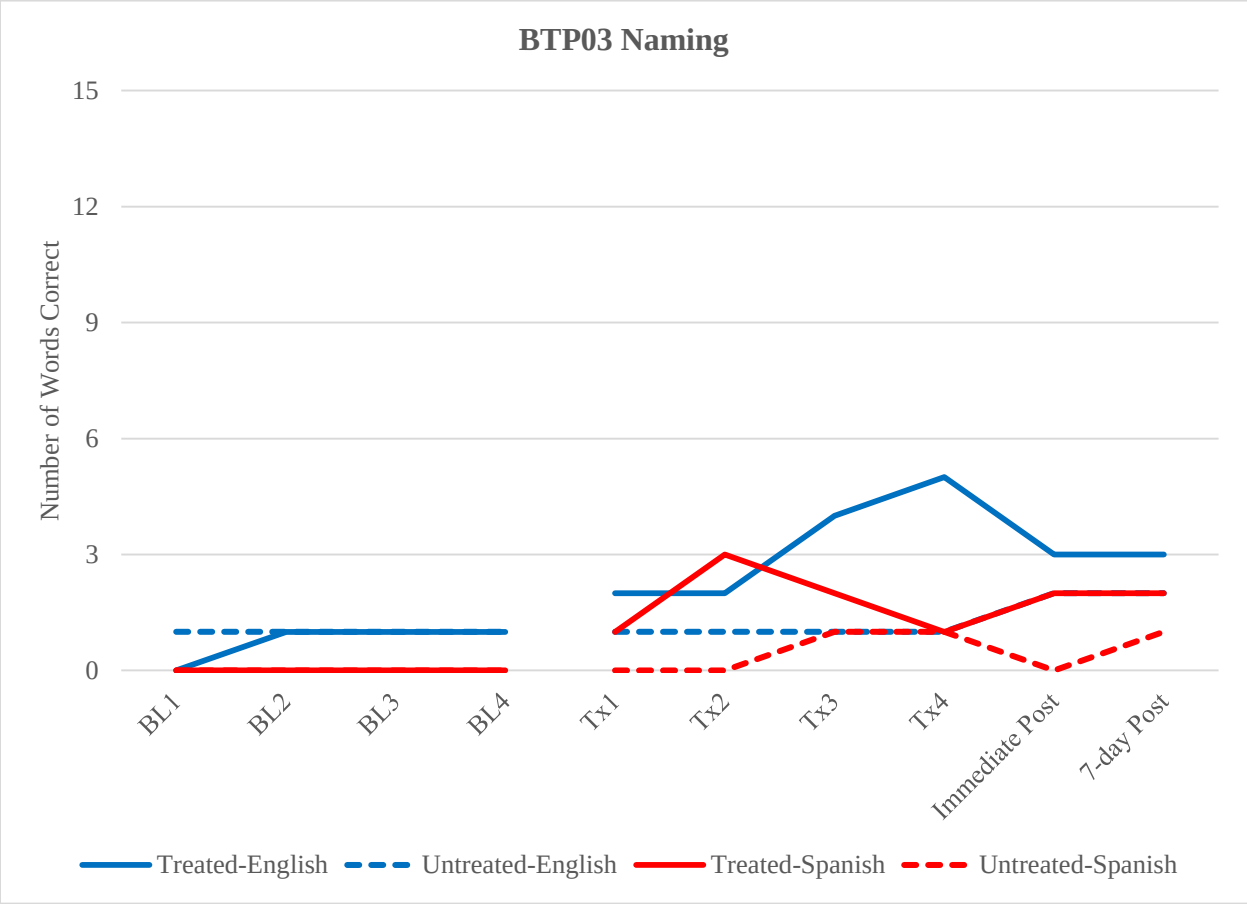


Figure 11. Naming graph for BTP12 in the Blocking: English First condition, showing significant learning in English, but not in Spanish.

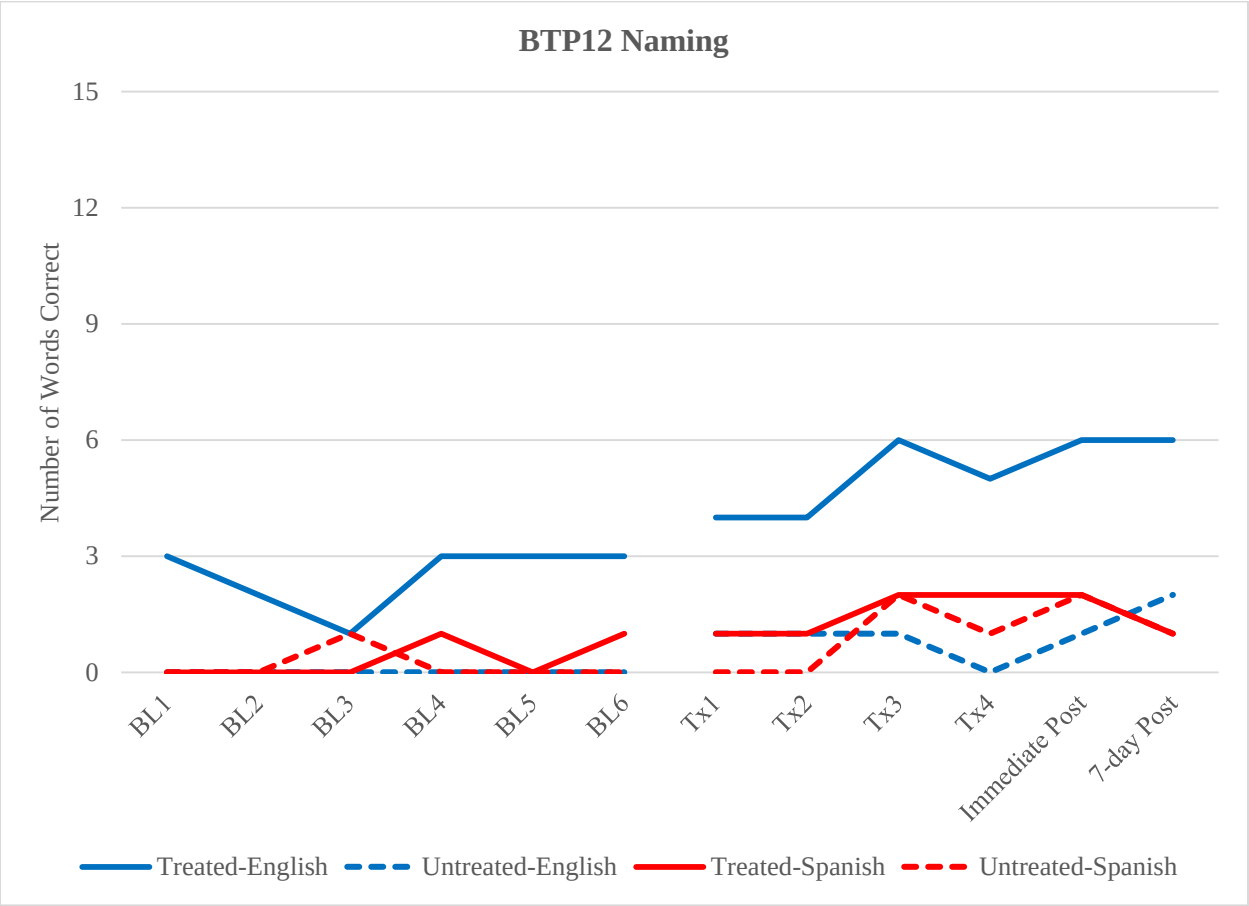
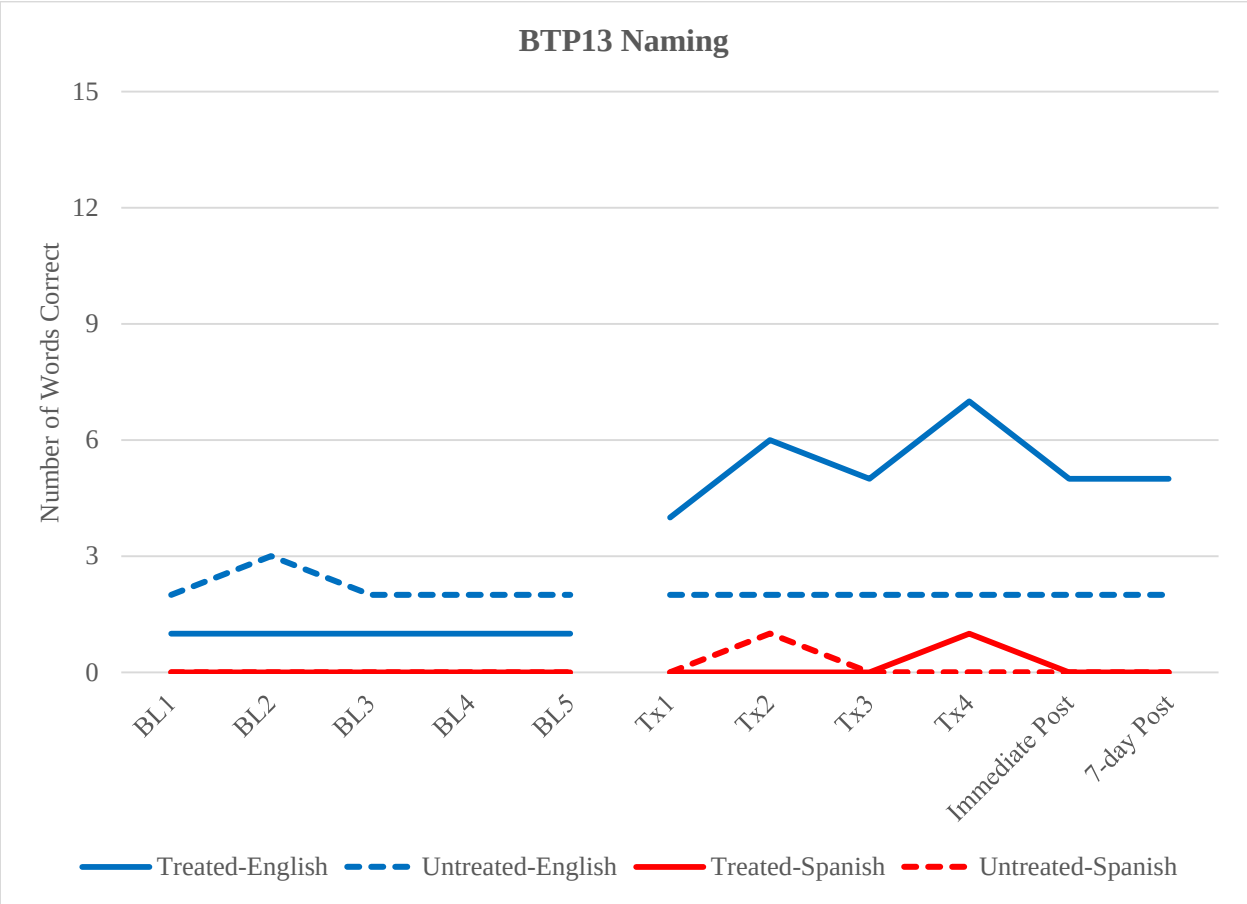


Figure 12. Naming graph for BTP13 in the Blocking: English First condition, showing significant learning in English, but not in Spanish.



Overall, the participants in the Blocking: English First condition demonstrated a consistent pattern in the accuracy of the vocabulary in English, but not in Spanish. One out of the three participants showed broad, significant improvement in the naming and comprehension of the treated words in both languages. The other two participants only showed accuracy of the English treated words in the naming task, but no accuracy of the words in Spanish was demonstrated in either of the tasks.

Bridging Participants

Comprehension Task. In Figures 13, 14, and 15, the graphs for the comprehension task for the participants (BTP04, BTP05, and BTP10) in the Bridging condition are displayed. As

shown in Figure 13, BTP04 showed similar comprehension of the treated and untreated words in English, Tau-*U* = 0.64, large effect, 90% CI [0.010, 1], *p* = .0947, and in Spanish, Tau-*U* = 0, no effect, 90% CI [-0.630, 0.630], *p* = 1. Similarly, BTP05 (Figure 14) did not show significant accuracy of the treated words in English, Tau-*U* = 0.28, moderate effect, 90% CI [-0.350, 0.910], *p* = .4647, nor Spanish, Tau-*U* = -0.44, moderate effect, 90% CI [-1, 0.190], *p* = .2506. However, the results for BTP10 (Figure 15) revealed a significant difference in the comprehension of the treated and untreated words in both English, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009, and Spanish, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009, with a very large effect size in both languages.

Figure 13. Comprehension graph for BTP04 in the Bridging condition, showing no significant learning in either language.

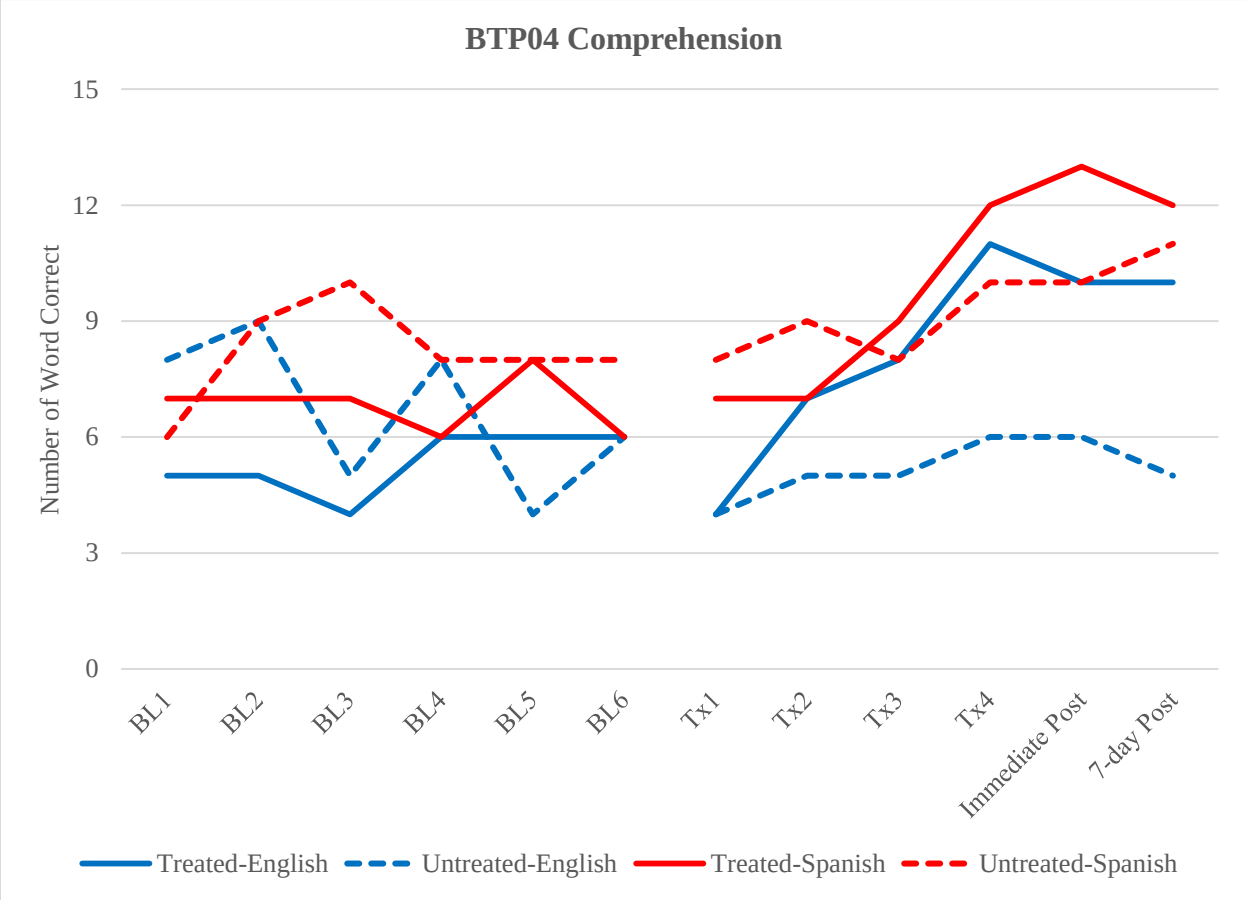


Figure 14. Comprehension graph for BTP05 in the Bridging condition, showing no significant learning in either language.

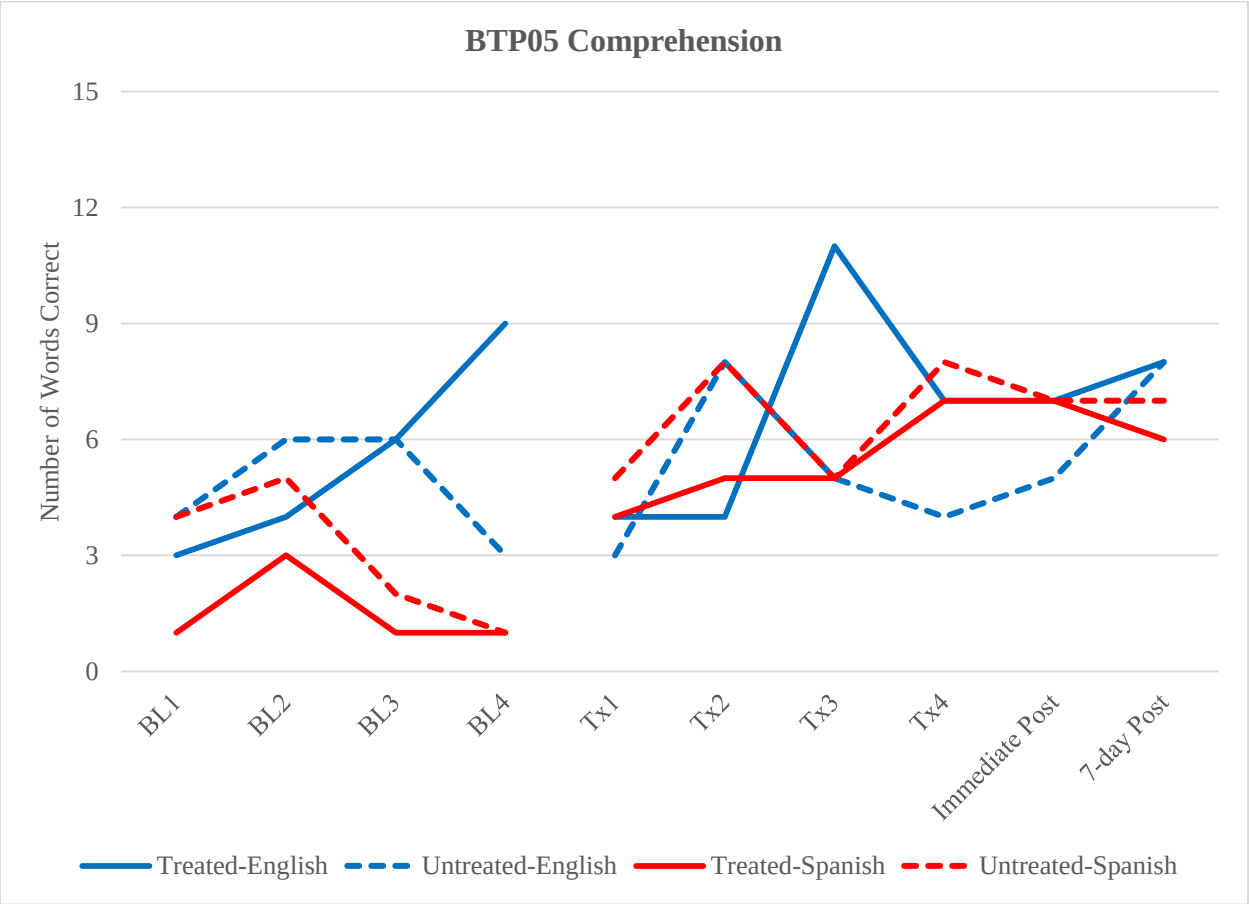
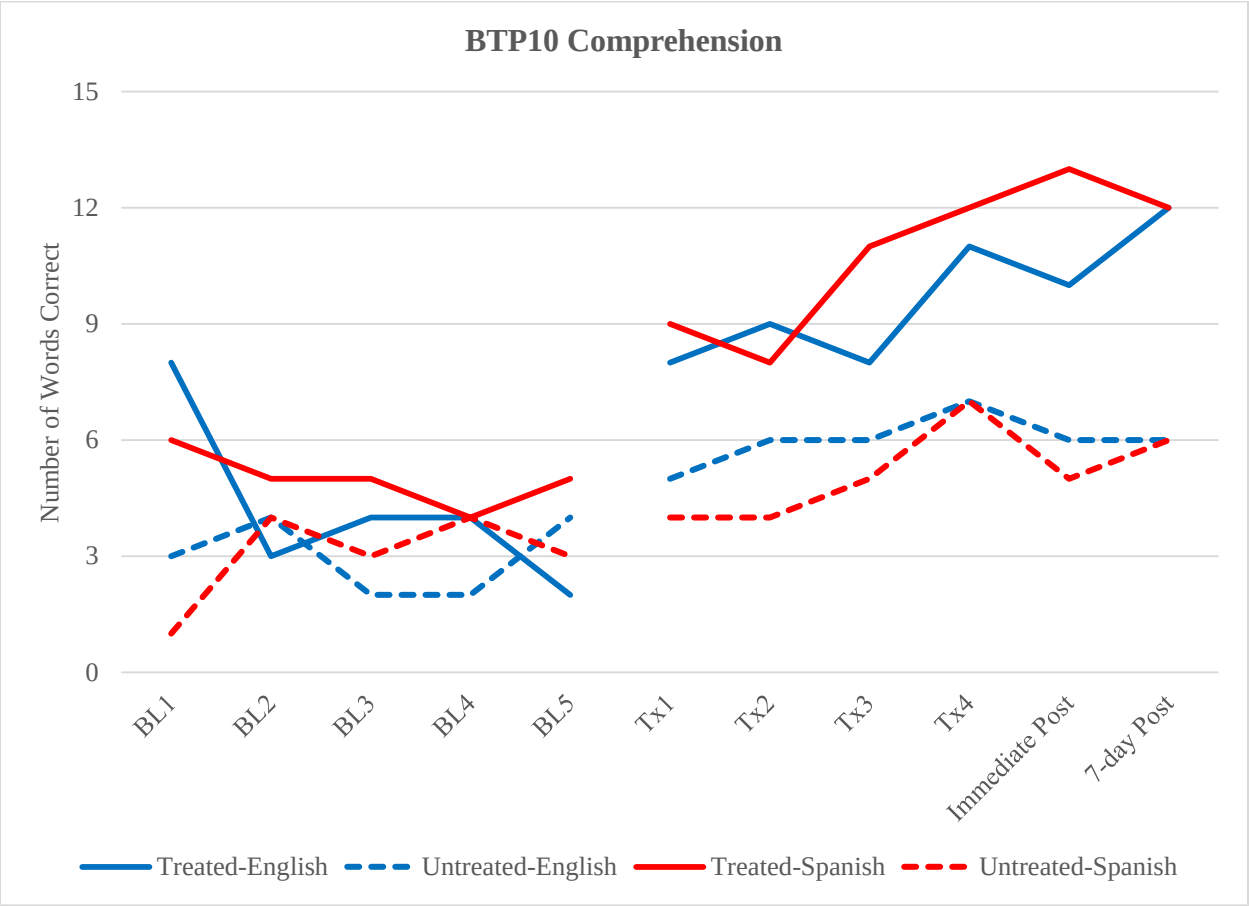


Figure 15. Comprehension graph for BTP10 in the Bridging condition, showing significant learning in both languages.



Naming Task. The graphs for the naming task for the participants in the Bridging condition are displayed in Figures 16, 17, and 18 below. Based on the visual inspection of BTP04's graph (Figure 16), a large gap exists between the treated and untreated words in English, suggesting that naming for treated words may have been better than untreated words. Nevertheless, the statistical analysis revealed no significant difference between the naming of the treated and untreated words in English, Tau-*U* = 0.72, large effect, 90% CI [0.090, 1], *p* = .0601. On the other hand, a very large effect size and significant difference occurred between the treated and untreated words in Spanish for BTP04, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009. BTP05 (Figure 17) showed the complementary pattern, demonstrating a large effect size and significant

difference in the accuracy of the treated and untreated words in English, Tau-*U* = 0.8, large to very large effect, 90% CI [0.170, 1], *p* = .0367, but no significant difference between the treated and untreated words in Spanish, Tau-*U* = 0.2, small to moderate effect, 90% CI [-0.430, 0.830], *p* = .6015. In contrast, BTP10 (Figure 18) showed a large effect size and significant difference between the English treated and untreated words, Tau-*U* = 0.76, 90% CI [0.130, 1], *p* = .0472, and a very large effect size and significant difference between the treated and untreated words in Spanish, Tau-*U* = 1, 90% CI [0.370, 1], *p* = .009.

Figure 16. Naming graph for BTP04 in the Bridging condition, showing significant learning in Spanish, but not in English.

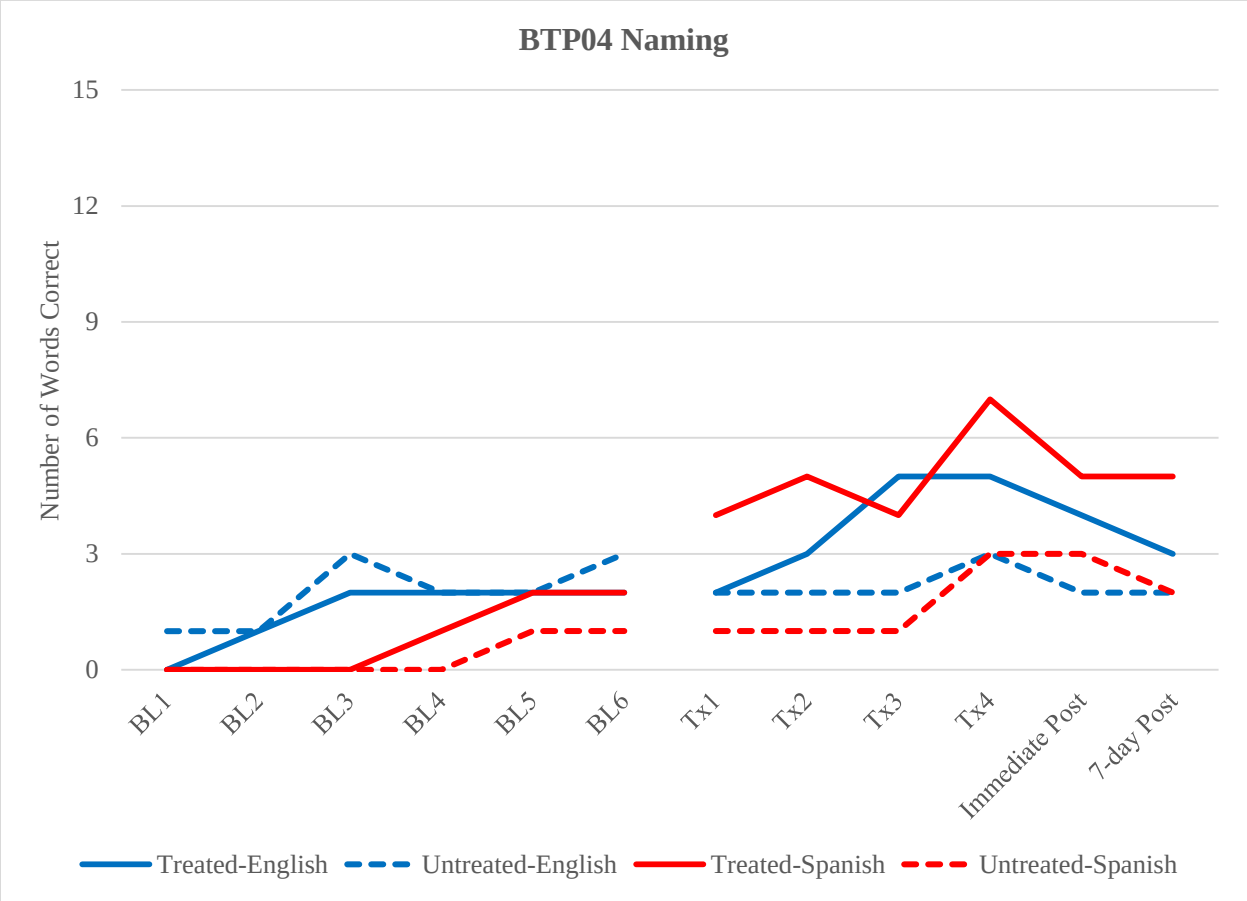


Figure 17. Naming graph for BTP05 in the Bridging condition, showing significant learning in English, but not in Spanish.

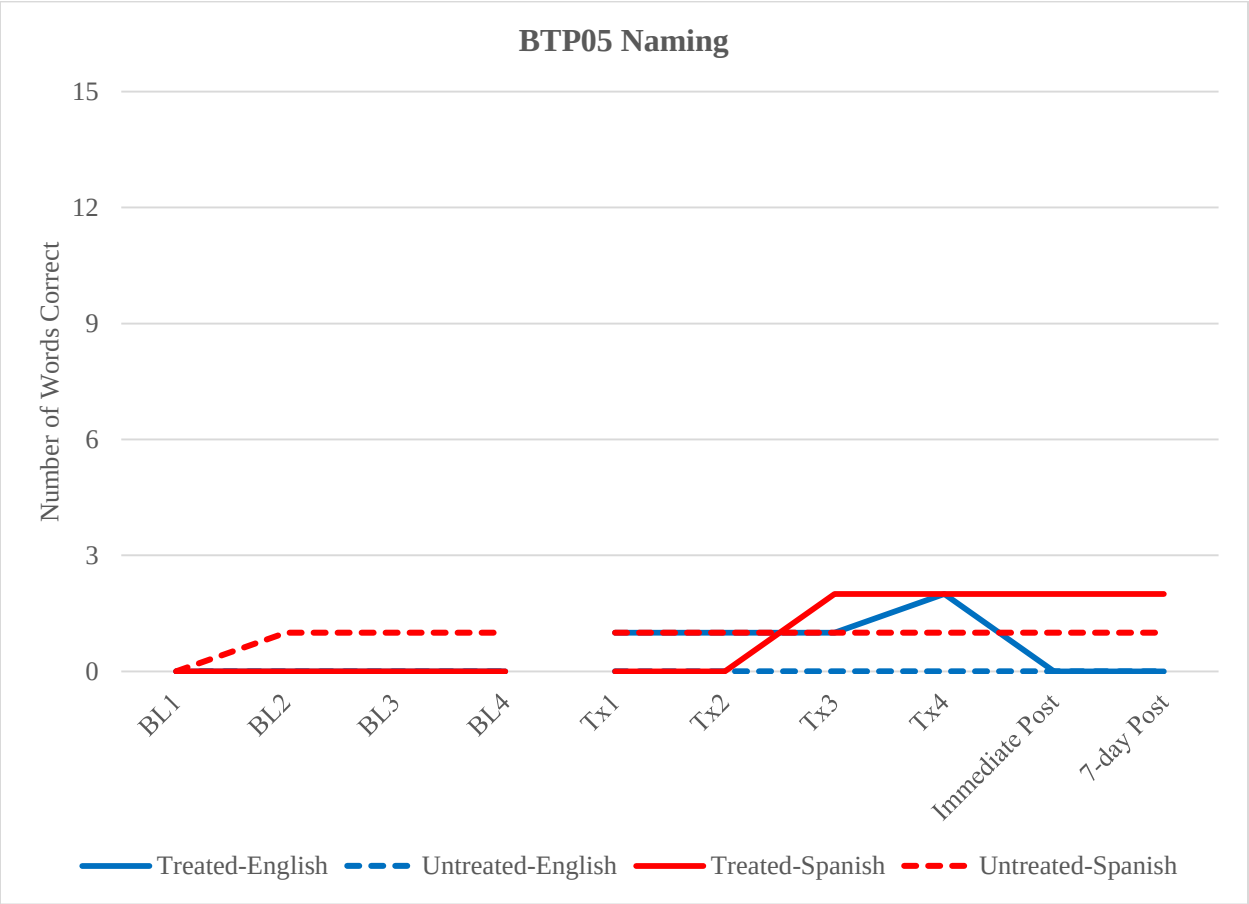
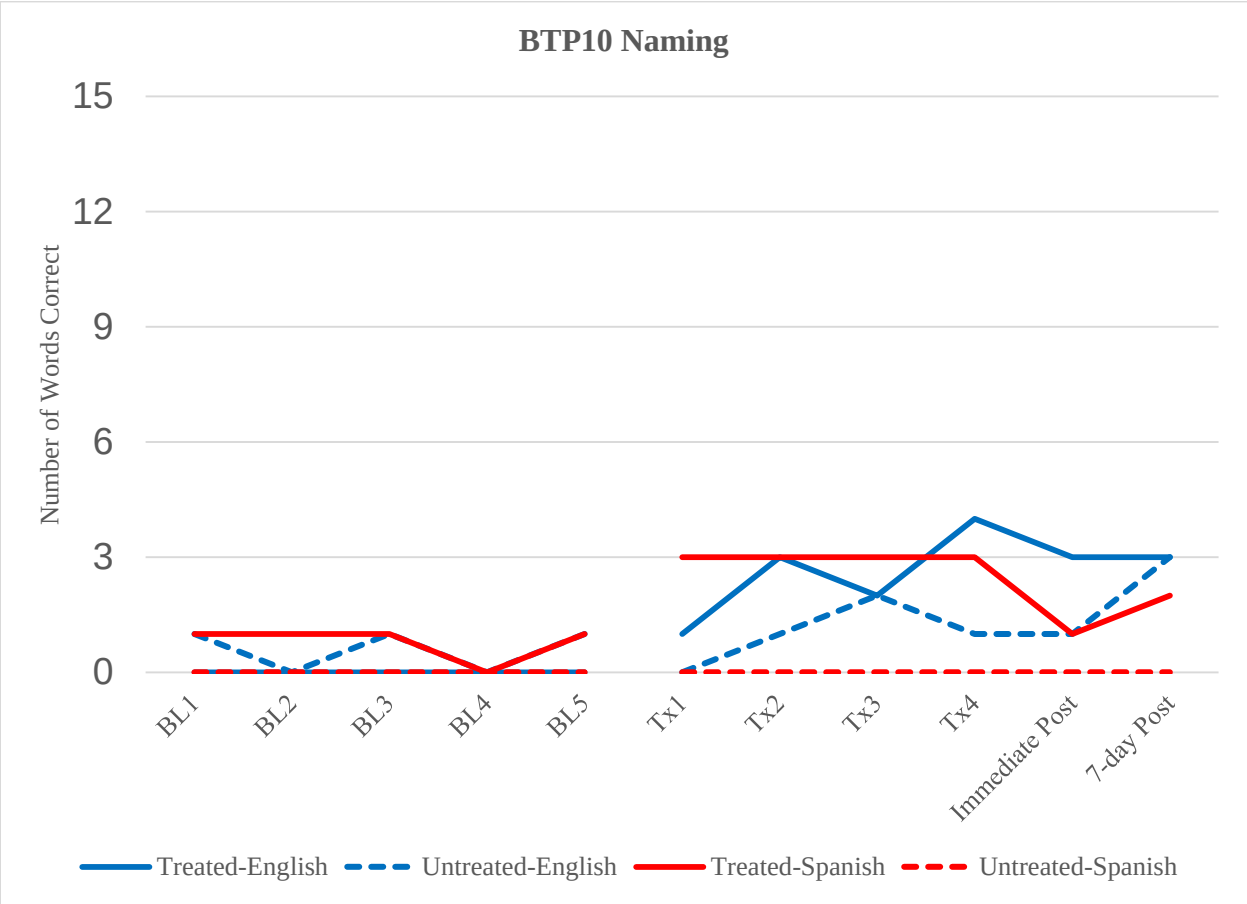


Figure 18. Naming graph for BTP10 in the Bridging condition, showing significant learning in both languages.



In summary, the results of the comprehension and naming tasks for the Bridging condition revealed accuracy of the treated words was higher than accuracy for the untreated words for two out of the three participants in English and two out of the three participants in Spanish. Only one out of the three participants demonstrated higher accuracy of the treated words versus the untreated words across the two languages in the naming and comprehension tasks. The other two participants showed progress only in the naming task, with one only demonstrating higher accuracy of the treated words in English and one only in Spanish.

Aim 2

In order to compare the three treatment conditions (Blocking: Spanish First, Blocking: English First, and Bridging), the data for all of the participants in each condition were placed in one analysis comparing treated to untreated words during and immediately post-treatment using the Tau-*U* metric effect size calculator (Vannest, Parker, & Gonen, 2011). Tau-*U* scores were computed for English comprehension, Spanish comprehension, English naming, and Spanish naming to determine whether responses to treated words were significantly different from responses to untreated words for each treatment condition individually. Table 10 provides a summary of the Tau-*U* scores obtained for each condition in the comprehension and naming tasks in English and Spanish.

Table 10. Summary of Tau-*U* Scores for Each Condition (Treatment vs. No Treatment)

	Condition		
Task	**Blocking: Spanish First**	**Blocking: English First**	**Bridging**
English Comprehension	0.37 (moderate)	0.71* (large)	0.64* (large)
Spanish Comprehension	0.05 (small)	-0.09 (small)	0.19 (small)
English Naming	0.36 (moderate)	0.97* (very large)	0.76* (large)
Spanish Naming	-0.07 (small)	0.4 (moderate)	0.73* (large)
Overall	Non-significant	Significant for English	Significant for both

Note: Tau-*U* scores are displayed with effect sizes in parenthesis. Positive numbers indicate higher gains were made in treated condition. Negative numbers indicate improvement in untreated words.

*Indicates statistically significant.

Blocking: Spanish First Condition

No significant effect of treatment was noted in the comprehension tasks in either English, Tau-*U* = 0.37, moderate effect, 95% CI [-0.0600, 0.8067], $p = .0913$, nor Spanish, Tau-*U* = 0.05, small effect, 95% CI [-0.3800, 0.4867], $p = .8094$. In addition, no significant effect of treatment was demonstrated in the naming tasks in either English, Tau-*U* = 0.36, moderate effect, 95% CI [-0.0734, 0.7934], $p = .1035$, nor Spanish, Tau-*U* = -.07, small effect, 95% CI [-0.5000, 0.3667], $p = .763$. In summary, no significance was noted in the accuracy of the treated words versus the

untreated words in English or Spanish in the Blocking: Spanish First condition. Effect sizes were moderate for English and small for Spanish.

Blocking: English First Condition

The results of the analysis demonstrated a large effect size and significant treatment effect for English words on the comprehension task, Tau-*U* = 0.71, 95% CI [0.2733, 1], *p* = .0014. However, no significant treatment effect was observed for the Spanish words on the comprehension task and the effect size was small, Tau-*U* = -0.09, 95% CI [-0.5267, 0.3400], *p* = .6729. On the naming tasks, a very large effect size and significant treatment effect was found for English, Tau-*U* = 0.97, 95% CI [0.5400, 1], *p* < .001. Nevertheless, no significant treatment effect was demonstrated for the Spanish words and the effect size was moderate, Tau-*U* = 0.4, 95% CI [-0.0334, 0.8334], *p* = .0704. Overall, a significant effect of treatment was noted only for English in the Blocking: English First Condition, but not for Spanish.

Bridging Condition

In this condition, a significant difference was noted between the accuracy of the treated words and untreated words for English on the comprehension task, Tau-*U* = 0.64, 95% CI [0.2066, 1], *p* = .0038, with a large effect size, but no significance was noted in the accuracy of the words in Spanish on the comprehension task and the effect size was small, Tau-*U* = 0.19, 95% CI [-0.2467, 0.6200], *p* = .3985. On the naming tasks, large effect sizes and significance were noted on the accuracy of the treated words, which was higher than the untreated words in English, Tau-*U* = 0.76, 95% CI [0.3266, 1], *p* = .0006, and Spanish, Tau-*U* = 0.73, 95% CI [0.3000, 1], *p* = .0009. Compared to the Blocking: Spanish First and the Blocking: English First conditions, the accuracy of the treated words was higher than the accuracy of the untreated words

across both English and Spanish in the Bridging condition, although the accuracy of the Spanish words was restricted to the naming task.

Taken together, only the Bridging condition led to significant learning of words in both languages. In contrast, Blocking: English First led to significant learning only in English, but not in Spanish. Finally, Blocking: Spanish First did not promote significant learning in either language. Based on these preliminary findings, the Bridging condition appeared to be the better condition for promoting learning in both languages.

Chapter 4: Discussion

The purpose of the current study was to examine the effectiveness of three different bilingual treatment conditions (Blocking: Spanish First, Blocking: English First, and Bridging) in the teaching of vocabulary in English and Spanish to bilingual preschoolers with SLI while controlling the number of exposures (i.e., 36 per word) across treatment conditions.

Based on the individual results obtained for each participant and the combined, overall results for the participants in each condition, the Bridging condition proved to be the most effective at promoting vocabulary growth in both English and Spanish. The Blocking: Spanish First condition provided inconsistent results in the learning of the treated vocabulary across the two languages when individual results were considered. Furthermore, the combined results across the three participants in the Blocking: Spanish First condition demonstrated this condition was ineffective in the teaching of vocabulary in either language. Although the Blocking: English First condition demonstrated effectiveness at improving vocabulary knowledge in English and Spanish based on the analysis of individual scores, the learning of the vocabulary was more restricted to the English words for most of the participants. In addition, the combined results of the participants in the Blocking: English First condition revealed significant results for English vocabulary, but not for Spanish.

Ultimately, all of the participants in the three conditions received an equal amount of exposure to English and Spanish, regardless of which language was presented first. Furthermore, their language abilities were relatively balanced, with an average BIOS EIO score of 48% and an average SIO score of 52% across all of the participants. Nevertheless, four out of the nine participants learned the treated words in English only: one in the Blocking: Spanish First condition, two in the Blocking: English First condition, and one in the Bridging condition. Other

studies with ELL preschoolers with SLI (Simon-Cereijido & Gutiérrez-Clellen, 2014; Tsybina & Eriks-Brophy, 2010) have reported more learning in English than in Spanish as well. In their bilingual storybook intervention study implemented in the classroom by preschool teachers, Simon-Cereijido and Gutiérrez-Clellen (2014) noted that the children with language impairments made more gains in English compared to Spanish, which was surprising, considering that the children were exposed to slightly more Spanish in the classroom compared to English. In the study by Tsybina and Eriks-Brophy (2010), the participants did not differ significantly in their amount of exposure to each language and, although significant gains were made in the English and Spanish vocabulary after treatment, the children learned twice the amount of words in English than they did in Spanish (6.7 versus 3.2, respectively). The finding of greater learning in English than in Spanish in the current study is consistent with prior studies. However, other patterns across conditions did not replicate findings from prior studies.

The overall findings from both blocking conditions do not support previous research with ELLs with SLI (Restrepo et al., 2013; Tsybina & Eriks-Brophy, 2010) nor theoretical models of dual language acquisition that presenting L2 words in the L1 first allows for the facilitation of the learning of the L2 target words (Cummins, 1976, 1979, 1981, in MacSwan & Rolstad, 2005). In the case of the Blocking: Spanish First condition, presenting the words in Spanish first did not prove effective in increasing vocabulary knowledge in either language and in the Blocking: English First condition, presenting the treated words in English first led to increased learning of the vocabulary in English only.

Some of the ways the previous studies conducted on ELL preschoolers with SLI that utilized a blocking approach differed from the current one include: the number of participants, the age of the participants, the language exposure of the participants, and the setting of treatment.

The study by Tsybina & Eriks-Brophy (2010) included a small sample size (12) of younger children ranging in age from 22-42 months with relatively equal exposure to both languages, and the treatment was conducted in the participants' homes in a one-on-one setting by a researcher in English and a parent in Spanish. The study by Restrepo et al. (2013) was conducted in an academic setting, treatment was researcher-led and conducted in small groups, and it included a much larger sample composed of 202 participants aged 48-64 months with very limited English abilities. It must be noted that Tsybina and Eriks-Brophy (2010) do not specify which language (i.e., English or Spanish) was utilized first in the teaching of the vocabulary and, since the Spanish treatment sessions were conducted mostly unsupervised by the mothers at home, the authors question whether code-switching may have taken place during the parent-led sessions. As a result, the possibility exists, at least for some of the participants in the study by Tsybina and Eriks-Brophy (2010), that treatment was provided in a bridging method rather than one in which the languages were blocked, making it difficult to compare the results of their study to the current one.

Nevertheless, compared to the study by Tsybina and Eriks-Brophy (2010), the participants in the current study were older, had received more exposure to English in an academic setting, and were receiving speech-language services in English (whereas the participants in the study by Tsybina and Eriks Brophy were on the waiting list to receive services). Compared to the study by Restrepo et al. (2013), the participants in the current study had relatively equal exposure to both languages. As a result, the possibility exists that the cumulative, additional exposure to English by the participants in both blocking conditions in the current study led to their being more on the verge of becoming more English dominant, which is why the Blocking: Spanish First condition was ineffective and, yet, the Blocking: English First

condition yielded significant increases in vocabulary growth in English only. In addition, since the participants in the current study were more accustomed to receiving academic instruction in English only and not in Spanish, the Blocking: English First condition may have been more beneficial because it was a better fit for their environment, particularly since this study was academic in nature and the protocol utilized in this study reflected the academic language typically used in English-speaking schools in the United States. It may be that the Spanish sessions the participants received in the current study may not have been sufficient to compensate for the instruction they had already received in English.

In the case of the Blocking: English First condition, however, without a comparison, it is difficult to ascertain whether the provision of the Spanish support in this condition contributed to the learning of the words in English. In the study by Restrepo et al. (2013), the participants in the bilingual vocabulary group demonstrated the same level of learning of the English vocabulary as the group who received the instruction in English only, although the bilingual vocabulary group made improvements in the vocabulary in Spanish as well. Thus, the current study is similar to the one by Restrepo et al. (2013) in showing learning of English vocabulary in a bilingual blocking condition, but departs from Restrepo et al.'s in the lack of learning of Spanish vocabulary in a bilingual blocking condition.

Compared to the two blocking conditions, the combined, overall results from the participants in the Bridging condition proved that this condition was the best at improving vocabulary knowledge in both English and Spanish. Since the children in the current study were more balanced in their language skills and exposure, this method may have been the best one for them. The Bridging condition demonstrated that children with SLI can switch between the languages without difficulty and that code switching can take place at no cost to the learning of

vocabulary in English and Spanish. In fact, the synergy between the languages in the Bridging method proved helpful in the learning of the vocabulary in both English and Spanish. As a result, the immediacy of combining the two languages may have been the best option for ELL children with SLI, since the bridging condition was the most natural of the conditions in that it was more like code-switching, which is a linguistic reality in most Spanish-dominant communities in the United States. In a blocking condition, benefit is going to be obtained only if something was actually learned in the session. That is, blocking assumes that learning in one session will carry over to the next. The separation of time between the languages in the blocking conditions may have been too much for the participants to make a connection between the languages. Given how difficult it is for children with SLI to learn words, the delay between using each language may have put them at a disadvantage for fully utilizing both languages (e.g., if no learning took place in a given session, they did not get carryover to the next session). In the Bridging condition, the children received dual language support immediately, which may have established a better connection between the languages and, thus, boosted their learning, making this condition superior to the Blocking: English First and the Blocking: Spanish First conditions in the acquisition of vocabulary in both English and Spanish.

The results of the Bridging condition in this study provide empirical support to the current research on "translanguaging," which is a practice used by bilingual students to communicate and make meaning by drawing on and intermingling linguistic features from different languages (Hornberger & Link, 2012). According to Hornberger and Link (2012), translanguaging should be utilized as a pedagogical strategy in the academic setting to foster language and literacy development in culturally and linguistically diverse students, and it does not require that educators master each and every language spoken by their students. Considering

that code-switching is a natural phenomenon among bilinguals, the use of both languages in the academic setting and in speech-language treatment should be supported for ELLs, particularly ELLs with SLI. Presenting the results of this study and the current research on translanguaging to school boards will, hopefully, prove fruitful in obtaining support for the use of two more languages in the academic and speech-language development of ELLs with SLI.

Study Limitations and Future Directions

The most noteworthy limitation in the current study is the small sample size. An extension of the current study with a larger sample that also includes ELL preschoolers with SLI as young as three years old (when they typically begin receiving speech-language services from the schools), would provide additional information regarding the suitability of each condition in terms of how strong a child is in each language. Considering that during the course of dual language exposure and development the exposure and strength of each language changes over time, particularly for bilingual children in the United States, additional research that systematically manipulates the children's English and Spanish skills is needed in order to determine not only which condition is best for promoting language growth in both languages, but under which context it is better.

An additional limitation to the current study may be the shorter treatment length compared to what has been done in previous studies with ELLs with SLI (Tsybina & Eriks-Brophy, 2010; Restrepo et al., 2013). One wonders if better results would have been obtained had the treatment in the current study been longer. It must be noted, however, that this is the first study to control for the number of exposures of vocabulary. As a result, it is difficult to compare the treatment intensity between the current study and prior studies. The current study defined intensity in terms of number of exposures (Warren, Fey, & Yoder, 2007) and this intensity was

achieved through 24 treatment sessions in English and Spanish, plus two review sessions, one in English and one in Spanish. The prior studies did not report intensity in terms of number of exposures, but did report number of treatment sessions. The study by Tsybina and Eriks-Brophy (2010) included 30 treatment sessions in English and Spanish, while Restrepo et al.'s (2013) included 36 treatment sessions in English and Spanish, plus 12 review sessions in English and Spanish. It is possible that children in the prior studies received more exposures to the target vocabulary than in the current study. However, it is also possible that they achieved the same or fewer exposures over a longer period of time. In any case, it is difficult to know how treatment intensity might impact which treatment approach leads to better gains in English and Spanish vocabulary by ELL children with SLI. Likewise, there are differences between the current study and clinical practice in terms of how long an ELL preschooler with SLI receives speech-language services. It would be expected that an ELL preschooler with SLI will receive speech-language therapy for a much longer time than what was utilized in the current study. As a result, a future study should consider the realities that SLPs face when it comes to the provision of services for ELL preschoolers with SLI.

Another recommendation to the extension of the current study would be to include an additional condition in English only to use as a comparison for the Blocking: English First condition. The lack of an English-only comparison for the participants in the Blocking: English First condition who only learned the treated words in English made it difficult to conclude whether providing treatment in Spanish also contributed to the learning of the English words or whether the same learning would have taken place had the treatment been in English only. An English-only condition may shed some light on the effectiveness of the Blocking: English First condition, at least in the teaching of English vocabulary. It is possible that a monolingual

approach could be appropriate at certain point in development, particularly for children who receive a higher exposure to English and who demonstrate a stronger dominance for the English language. For most ELL children, this transition occurs as they become older and as they continue to receive schooling in English only.

Conclusion

The current study contributed to the limited research available on storybook reading intervention aimed at increasing vocabulary knowledge in ELL preschoolers with SLI. This was the first study to compare the effectiveness of three different bilingual treatment conditions (two blocking conditions and a bridging condition) in the teaching of new words in English and Spanish to ELLs with SLI. Compared to the findings from previous research, the current study did not provide strong support for the utility of blocking conditions in increasing vocabulary knowledge in both English and Spanish. Based on the analysis of the three conditions, the Bridging condition proved to be the most effective at promoting vocabulary growth across the two languages. Whereas bridging conditions had only been proven effective for increasing vocabulary knowledge in typical ELL preschool children, this is the first study to extend that research to ELL preschool children with SLI and to indicate that a bridging approach may be optimal for ELL preschool children with SLI. The current study also indicates that more research is needed to better understand what treatment approaches are optimal over the course of dual language learning where exposure to each language and strength of each language changes over time. It is possible that the optimal treatment will vary over this dynamic period of dual language learning.

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Appendix A: Information on Measures

The primary investigator used a GSI 17 audiometer to screen the participants' hearing. The children were asked to either raise their hand and/or to place a marble in a cup each time they heard a tone. The primary investigator demonstrated the task by first playing a frequency loud enough to be heard through the headphones without being placed on the head. The primary investigator would then demonstrate what to do once the tone was heard. The children were given practice trials prior to beginning the screening in order to ensure they understood the task.

The nonverbal subtests (Odd-Item Out and What's Missing) of the Reynolds Intellectual Assessment Scale (Reynolds & Kamphaus, 2003) were used to assess the participants' nonverbal cognitive development. In the Odd-Item Out subtest, the participants were asked to look at a set of pictures and to identify the picture that did not belong. In the What's Missing subtest, the participants were asked to look at a picture and identify what was missing. The RIAS provides subtest *T* scores having a mean of 50 and standard deviation of 10, confidence intervals, percentile rankings, and age equivalents. The *T* scores for the nonverbal subtests can be combined into a Nonverbal Intelligence Index (NIX) score. The NIX score "provides a summary estimate of nonverbal intelligence as assessed by nonverbal reasoning and reflects primarily fluid intellectual functions" (Reynolds & Kamphaus, 2003).

The Bilingual English Spanish Assessment (BESA, Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014) is a comprehensive assessment measure of speech and language abilities in English in Spanish and is normed on bilingual (English/Spanish) children ranging in age from 4;0 to 6;11. It includes three subtests addressing the language domains of morphosyntax, semantics, and phonology in English and Spanish. It also includes a criterion-referenced activity allowing for the observation of pragmatic language (this task was not utilized

in this study). The BESA includes the Bilingual Input-Output Survey (BIOS), which asks parents about the language exposure history of their child and provides information regarding the language(s) the child hears and uses during a typical weekday and a typical weekend. A formula is provided to obtain the average percentage of Spanish input and output (SIO) and English input and output (EIO).

In the BESA phonology subtest, the participants were asked to name 28 single words in Spanish and 31 single words in English. This subtest is designed to diagnose typical from atypical phonological skills in bilingual children (Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014). In the BESA morphosyntax subtest, the children completed sentences in a cloze task and repeated sentences in a sentence repetition task. The forms tested in English include plural –s, possessive –s, past and present tense, third-person singular, progressives, copulas, auxiliary do + negatives, and passives, as well as complex verb forms, conjunctions, and embedded prepositions and noun phrases. In Spanish, the forms tested include articles, progressives, clitics, subjunctives, preterite, complex verb forms, and conjunctions (Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014). The semantics subtest includes receptive and expressive items targeting analogies, characteristic properties, categorization, functions, linguistic concepts, and similarities and differences. The scoring for this subtest allows the children to receive credit for correct responses provided in either language (Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014). Six sets of scaled and standard scores are obtained after administration of the BESA in English and Spanish (three sets of scores for phonology, morphosyntax, and semantics in each language). In addition, the BESA provides age-equivalent scores and percentile ranks, as well as a Language Index standard score, which is

derived based on the weighted average of the best morphosyntax and best semantics standard scores.

Appendix B: Sample of Blocking: English First Condition (Weeks of Treatment)

Weeks 1-6	Day 1 & 3 (English version of book)	Day 2 & 4 (Spanish version of book)
	• Storybook read all in English • Target vocabulary all in English • Definitions (2 exposures), synonyms (3 exposures), and context sentences (3 exposures) all in English • Test naming and comprehension of target and control words all in English	• Storybook read all in Spanish • Target vocabulary all in Spanish • Definitions (2 exposures), synonyms (3 exposures), and context sentences (3 exposures) all in Spanish • Test naming and comprehension of target and control words all in Spanish
Week 7	• Review of previously taught vocabulary all in English: 1 definition, 1 synonym, and 2 context sentences (4 additional exposures)	• Review of previously taught vocabulary all in Spanish: 1 definition, 1 synonym, and 2 context sentences (4 additional exposures)

Appendix C: Sample of Blocking: Spanish First Condition (Weeks of Treatment)

Weeks 1-6	Day 1 & 3 (Spanish version of book)	Day 2 & 4 (English version of book)
	• Storybook read all in Spanish • Target vocabulary all in Spanish • Definitions (2 exposures), synonyms (3 exposures), and context sentences (3 exposures) all in Spanish • Test naming and comprehension of target and control words all in Spanish	• Storybook read all in English • Target vocabulary all in English • Definitions (2 exposures), synonyms (3 exposures), and context sentences (3 exposures) all in English • Test naming and comprehension of target and control words all in English
Week 7	• Review of previously taught vocabulary all in Spanish: 1 definition, 1 synonym, and 2 context sentences (4 additional exposures)	• Review of previously taught vocabulary all in English: 1 definition, 1 synonym, and 2 context sentences (4 additional exposures)

Appendix D: Sample of Bridging Condition (Weeks of Treatment)

Weeks 1-6	Day 1 & 3 (Spanish version of book)	Day 2 & 4 (English version of book)
	• Storybook read all in Spanish • Target vocabulary all in Spanish • Definitions: 1 in Spanish, 1 in English (2 exposures) • Synonyms: 2 in Spanish, 1 in English (3 exposures) • Context sentences: 2 in Spanish, 1 in English (3 exposures) • Test naming and comprehension of target and control words all in Spanish	• Storybook read all in English • Target vocabulary all in English • Definitions: 1 in English, 1 in Spanish (2 exposures) • Synonyms: 2 in English, 1 in Spanish (3 exposures) • Context sentences: 2 in English, 1 in Spanish (3 exposures) • Test naming and comprehension of target and control words all in English
Week 7	• Review of previously taught vocabulary all in Spanish: 1 definition, 1 synonym, and 2 context sentences (4 additional exposures)	• Review of previously taught vocabulary all in English: 1 definition, 1 synonym, and 2 context sentence (4 additional exposures)